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PAVING SEWERAGE

MUNICIPAL ENGINEERING

WATERWORKS PARKS

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DEVOTED TO THE IMPROVEMENT OF CITIES.

GOOD ROADS, STREET CONSTRUCTION,
CLEANING AND LIGHTING,
SANITATION, BRIDGES.

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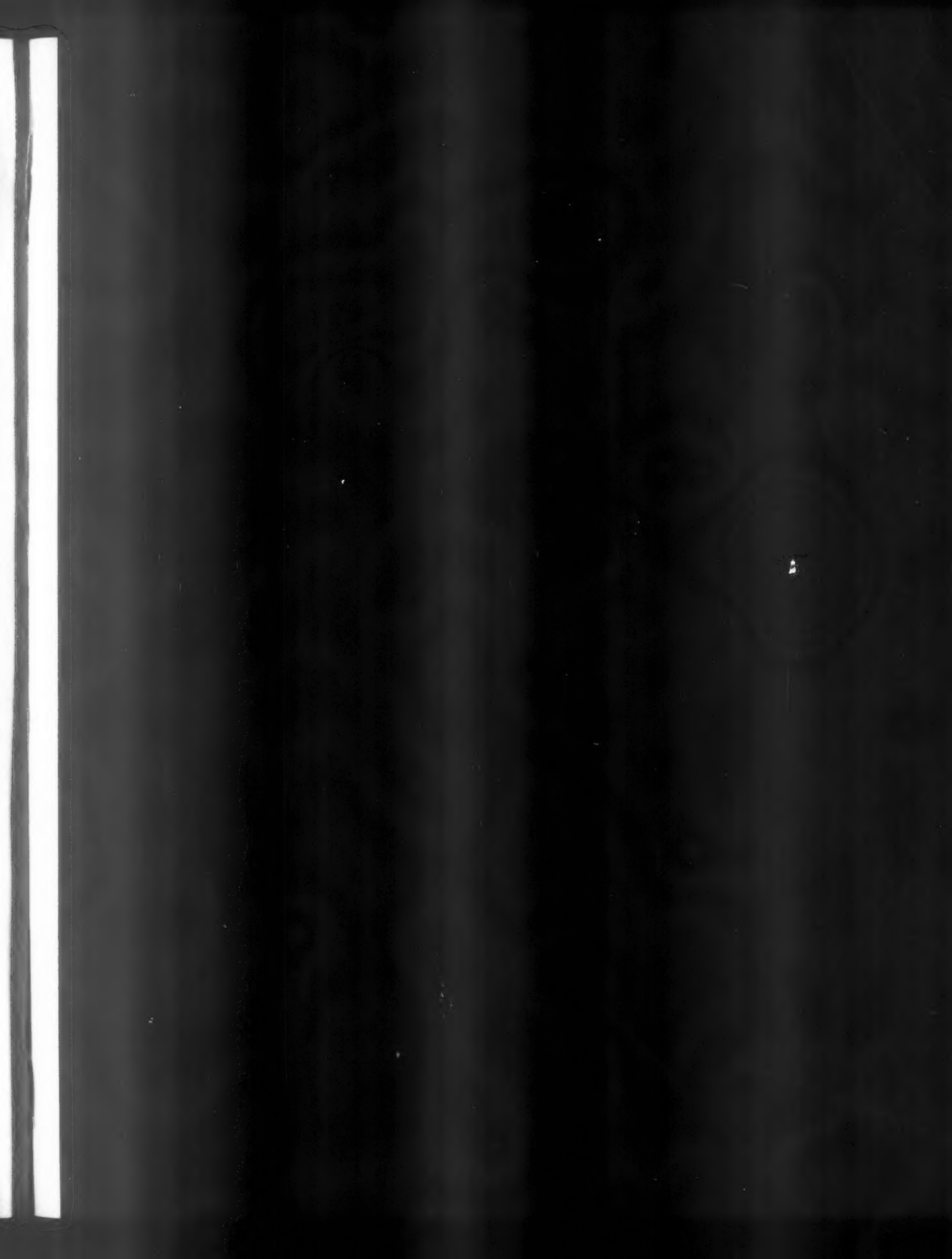
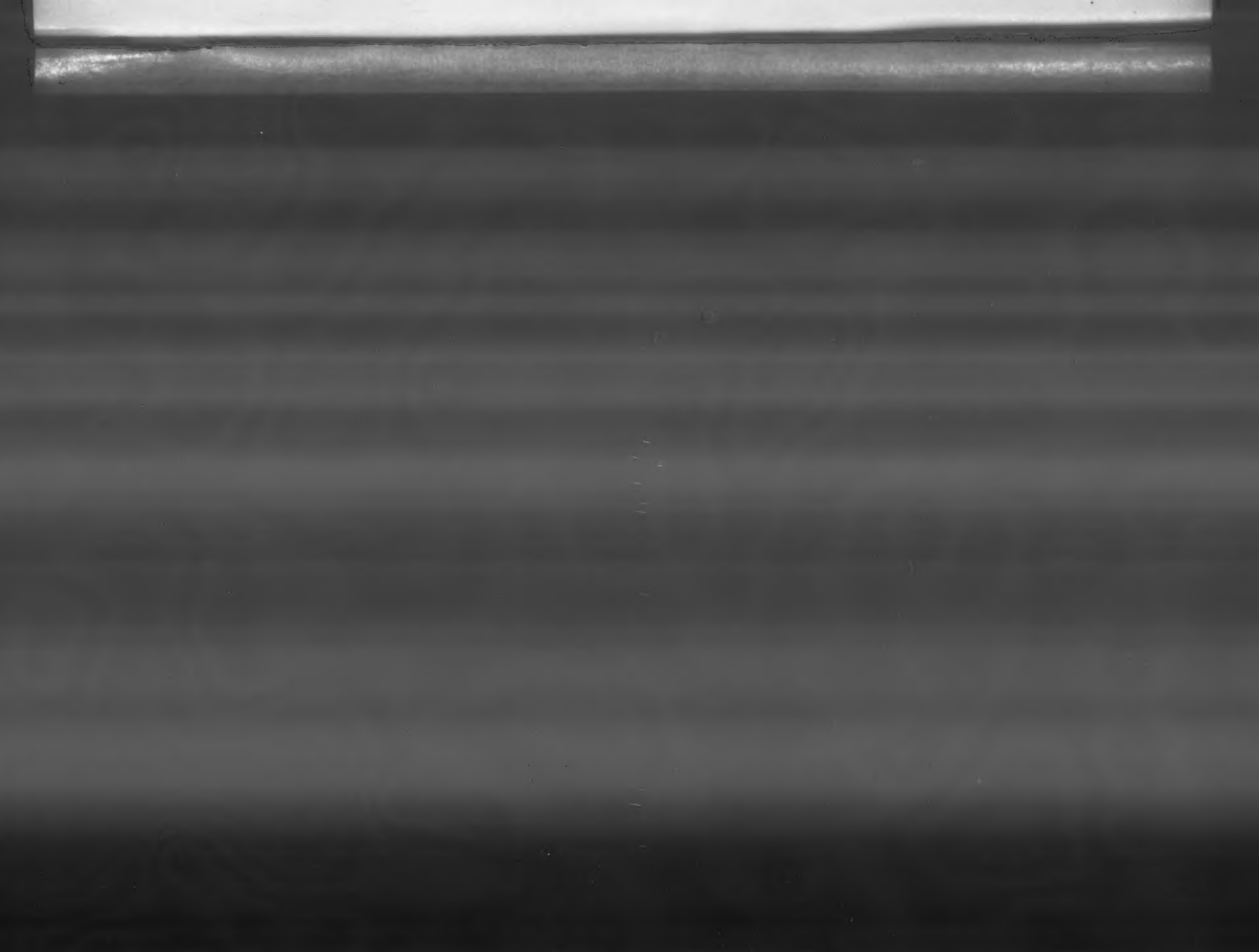




Municipal Engineering

VOLUME XIX. NOVEMBER, NINETEEN HUNDRED. NUMBER 5.

PAVEMENT HISTORY OF LAFAYETTE.

By W. K. Eldridge, City Engineer, Lafayette, Ind.

A short historical review of local progress in the line of street improvements in the city of Lafayette, from the crudest efforts up to the accomplishment of the highest ideals in street pavements, may be valuable to other cities now passing through similar stages and serve to some extent as an indication of methods to be avoided and of precautions to be taken.

The original plat of the town of Lafayette was laid out in 1825 on about fifty acres of land on the east bank of the Wabash river, and includes the court-house and present business center of the city. Slow growth by accretion on three sides took place up to the incorporation as a city in 1853 and thereafter by the platting of additions and extension of streets and alleys. Not much credit can be given, however, to those responsible for the lay-out, the blocks of ground being usually too small, and the streets too narrow and close together. The same area of streets of greater width and surrounding much larger blocks of ground would be much more desirable.

During the town government period, no street improvements of any consequence were undertaken except by private initiative, consisting of disconnected plank sidewalks, ditching, graveling, stepping-stones, etc., usual in villages at that time. Nor were matters much better until about 1857, when some demand arose for gravel or stone roadways, bowldered gutters, and brick sidewalks, there being ample facilities for obtaining good gravel, plenty of bowlders, and very fair bricks made on the ground.

There having been discovered, about this time, a bed of flint rock (commonly called "flint gravel" on account of the facility of plowing and loading the material without quarrying or crushing to size), about sixteen miles southwest of the city on the river bank, this material began to come into use on the business streets, and is still used here for macadamizing the better class of outlying streets. Much of this rock, and also screened gravel, was used until the demand arose for some kind of a smooth pavement. Before the pavement period arrived, the standard improvement of the better class comprised a flint or screened gravel road-bed (unrolled), bowldered gutters, stone curbing and brick sidewalks. For less prominent streets, unscreened gravel and gravel sidewalks were substituted. The stone curbing consisted merely of the best shaped rubble stones selected from boat loads of rough foundation stones brought in on the canal, and were practically undressed stones twelve to sixteen inches in depth with an average length of a foot and a half. Bowlder pavements were almost wholly restricted to the alleys; and while rough, noisy and unsanitary, have proved so durable that almost all paved alleys are still covered with the original bowlders, though the use of them in new work has been abandoned in favor of paving bricks. During and just after the war period, such street and alley improvements as are described above were carried out to such a vast extent (population and area considered) that Lafayette had the reputation of being the best improved city in the state, and compared well with any city in the middle west, according to the standards then in vogue. Indeed, these improvements became a serious handicap in later years, when standards had been raised; for it was claimed that they were too good to be thrown away; and even to this day the same claim is constantly made, so that it takes considerable nerve and enlightened public spirit for the city authorities to order a reimprovement.

The increase of business traffic and dis-

satisfaction with the condition of the main thoroughfares stimulated a spirited discussion of the necessity for street pavements, beginning about the year 1864, and resulting in the choice, in 1866, of a wooden block pavement laid according to the "Nicholson patent:" Main street and around the Public Square being so paved in 1867-8. The rectangular blocks were laid crosswise of the

MAKING GRADE—DETROIT.

street on planks bedded on gravel, the courses of blocks separated by means of laths tacked to the base of each course, and the interspaces filled with fine gravel and hot tar. Results were very satisfactory for a short time, but by 1873 much wear and deterioration had taken place, and extensive annual repairs began in 1874 and continued with less and less efficiency until renewal became an absolute necessity. The unprosperous condition of the people during the decade after the great panic of 1873, and the expenditure of $300,000 on a much needed system of water-works, postponed the re-improvements from year to year, after the pavement as such was almost totally destroyed; repairs being made with wood blocks, flint rock, hard common bricks, or anything handy at the time.

In the meantime, while paving conditions were going from bad to worse, struggles were being made to obtain better results in the more common street improvements. Cut stone curbing of greater depth and length began to be specified, and the channel shaped gutters were replaced by flattened gutters conforming to the crown of the roadway. A distinct step in retrogression was taken, however, in aid of persons developing speculative property for building purposes, by permitting improvements with channel gutters and gravel sidewalks, without curbing; and in some cases this is tolerated up to the present day. This method can be termed, however, only a *partial* improvement.

Paving conditions remained in the same unsatisfactory state up to 1887, when the round cedar block pavement was adopted as the most approved type, and the streets surrounding the court-house and radiating therefrom for one or two squares were thus repaved. The old gravel foundation was retained, covered with new 2-inch planks, the cedar blocks set directly thereupon, and the interspaces filled with gravel and tar.

Again were all woes supposed to be alleviated; but experience proved this pavement to be less durable than the former rectangular pattern of blocks; and I believe this will always prove to be the case, from the nature of things. Large sections of this pavement had to be completely relaid inside of eight years, using car-loads of cedar blocks at a time.

Attention began to be called about this time to the use of bricks for street paving, and in 1890 all of Main street (except the court-house frontage), and two squares leading north from Main, comprising 3,393 feet run, were repaved with a 2-course brick pavement on the same old foundation shaped up to the desired grade and cross-section. The under-course is of local hard bricks, laid flat, and the upper-course of vitrified common bricks from Illinois, perhaps the best obtainable at the time, and these pavements are still in use. The cross-section wear has been about 25 per cent. in nine years, and while the pavement is quite rough and noisy, it is still usable, has been re-

SETTING CURB—DETROIT.

paired very little (might have had more repairs to advantage), and proves to be the nearest approach to a success the city had attained up to that time.

So well was the brick pavement liked, that in 1893-4-5, 5,665 feet run of similar pavement were laid, using Veedersburg, Clinton and Canton common pavers of much better quality. These pavements are still in very good condition, and giving satisfac-

FORT STREET WEST, NEAR CLARKE AVENUE, DETROIT. PAVED WITH BRICK.

tion. No repairs have so far been necessary.

The next progressive step was when, after considerable argument and persuasion, I succeeded in getting adopted a specification for brick pavement using repressed brick blocks on concrete base. One square was laid after this method in 1896, with such success, that a concrete base is now the standard foundation for all pavements except suburban alleys, and of this class of pavement there have been laid to date 2,160 feet run of streets and 1,903 feet run of alleys. There is still in use three squares of cedar block pavement in poor condition.

Objection to the noise from brick streets and other influences soon led to a strong agitation for asphalt, culminating in the letting of contracts during 1899 for 8,813 feet run of sheet and 1,447 feet run of block asphalt, covering over 40,500 square yards of surface. Thus from small beginnings has progress been made to higher standards.

In conclusion, a fair classification of our present street improvements in order of importance, might be made about as follows:

1st. Sheet asphalt or asphalt block pavement on Portland cement concrete base, stone curbing and cement walks.

2d. Repressed brick block pavement on concrete base, stone curbing and cement walks.

3d. Macadam roadway with brick block gutters, stone curbing and cement walks; using Telford foundation on clay subsoils.

4th. Gravel roadway with brick block gutters, stone curbing and cement walks.

5th. Gravel roadway with brick block channel gutters, and cement walks.

6th. Gravel roadway with brick block channel gutters, and gravel sidewalks; the gravel walks being made of such depth, however, as to leave sufficient base for cement walks that may subsequently be laid.

"You pays your money and you takes your choice."

AN EXPERIMENTAL WATER FILTRATION PLANT; ITS DESIGN, USE, ECONOMY AND VALUE.

By Floyd Davis, E. M., Ph. D.

When an investigation shows that a water supply is in an unsatisfactory condition, the question what is the best and most economical means of purifying it naturally presents itself. Just how this can be done can not be determined without experiment. It may be that subsidence alone will remove the objectionable matter, or that the use of a coagulant in settling reservoirs will suffice; it may be that plain sand filtration will remove the impurities, or in some cases, before such filtration the water should be subjected to coagulation and subsidence; or it may be that mechanical filters, with or without coagulation, will give the best results. Every water should be considered by itself. No two are exactly alike, and because a certain system of purification has given satisfaction somewhere is no evidence that it will give the desired results in the case under consideration. The policy of sending a committee to visit purifying plants in operation to ascertain what is the best method of purifying water is one of the greatest follies that the engineering profession has to contend with, because no one can know beforehand what will be the result of any system until it is tried with the water in question.

From a business standpoint, it is very unwise for any water-works company or municipality to put in any system of purification until it has definite knowledge of what the results will be, as shown by a preliminary experimental investigation. Many failures have resulted from choosing a system that was not adapted to the work, and large amounts of money have been wasted from insufficient knowledge beforehand of what the system was capable of doing with the water in question. But when a proper method of purification has been selected, through preliminary investigation, an approximate estimate can be made of its cost and the best method of its operation. All cities which have adopted this method of procedure can testify to the wisdom of the plan.

In making the inquiry into the best system of purification, systematic experimental processes on a small scale are conducted similar to those adopted and successfully operated on the large scale for the purification of water in various parts of the world, and the degree of purification secured under such working conditions should be realized with a plant of sufficient size to handle the entire water supply of a city. Such experimental plants have been operated in a number of the more progressive cities, and

CANFIELD AVENUE, NEAR CASS, DETROIT. PAVED WITH TRINIDAD LAKE SHEET ASPHALT.

they have shown that preconceived notions of the best method of purification are sometimes widely different from what experiment proves to be right. The experimental means adopted are sedimentation, either with or without the use of a coagulant, and filtration through sand, so regulated and in connection with such appliances that the sand bed can be used either as an English, modified English or mechanical filter.

MIXING CONCRETE—DETROIT.

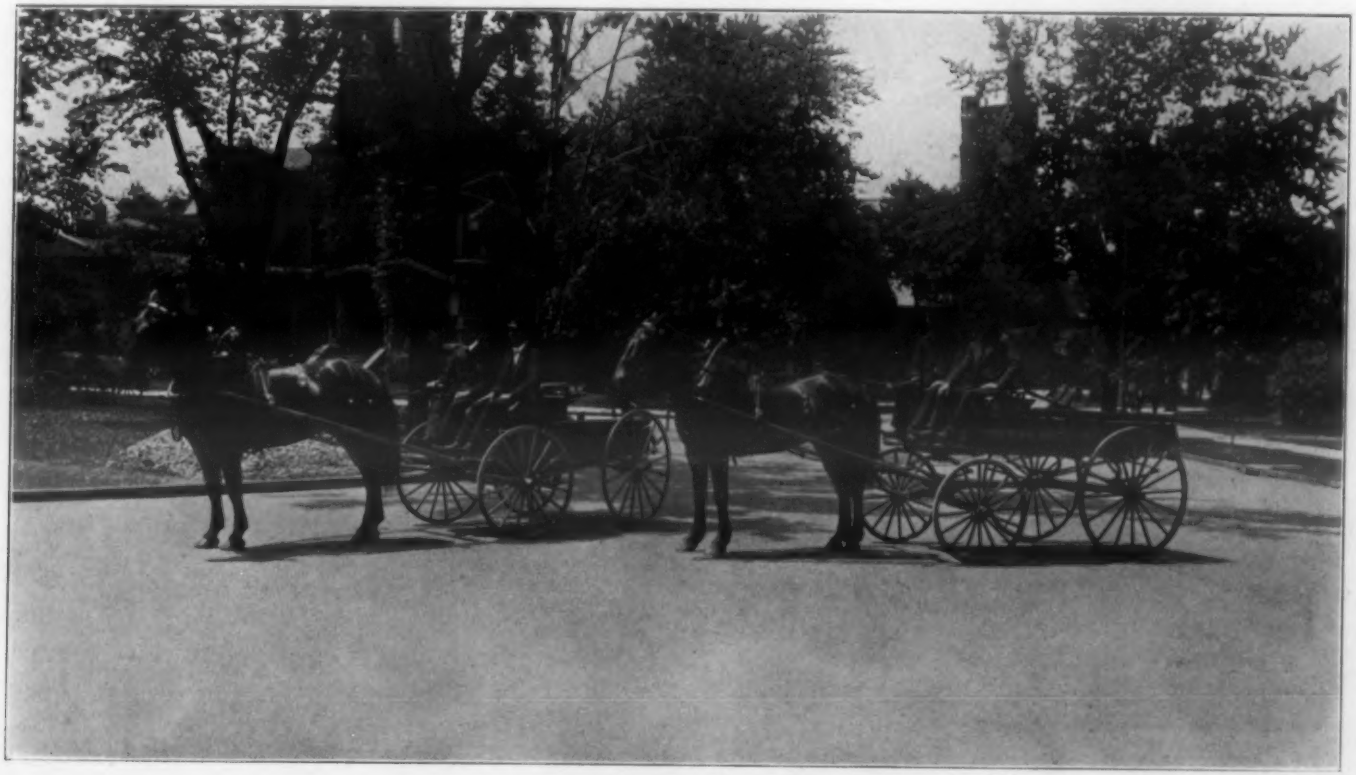
In planning an experimental purifying plant, it is generally desirable to make a device that can be placed in a building having a basement, with sewer connections, and an abundant supply of the water to be purified. The filter should be placed at the lowest level, in such a position that the purified water discharged from it near the floor can be easily conducted into the sewer and thus carried away. The coagulating and settling tank should be placed on the floor above, in such position as to allow the water to flow by gravity from it into the filter, while over this tank should be placed a small cask of sufficient size for the coagulating solution. Into the settling tank the water to be experimented upon should be allowed to flow, and from this it should pass to the filter bed below. When it is desired to operate the bed as an English filter, the check-valve at the bottom is partially closed, so as to reduce the head and thus allow only slow filtration, characteristic of this process. When it is desired to operate it as a modified English filter, the coagulation and subsidence take place in the tank before the water passes to the filter. And when it is desired to operate it as a mechanical system the check-valve at the bottom is opened sufficiently to produce high rates of filtration. For the English systems, the surface of the sand is scraped to remove the accumulated impurities, while in the mechanical system the whole mass of sand is washed by sending a reverse current of water up through it while the impurities are carried away in the overflow from the side of the tank.

Well-chosen appliances are necessary for an experimental filtering plant, but it is unwise to expend large sums of money in the construction of settling-tanks, filter-beds and mechanical devices, for such not only cause a needless outlay at the beginning, but also add very materially to the operating expense during the test. But by the adoption of a proper plant, the cost of construction need not exceed a few hundred dollars; and when a convenient location can be secured, it can be equipped easily with all appliances that make it complete for the purpose of comparing the various processes of purification. In connection with the daily samples of water that are taken for test of efficiency, a record should be kept of the rate of filtration, and the amount of water filtered during the period when the sample was taken. These facts are of service in determining the capacity of the filter, length of time between periods of cleaning the beds, and the operating expense of the plant.

The efficiency of English filters is generally ascertained by comparing the bacteriological tests of the filtered water with the English and German standards with a permissible limit of one hundred germs per cubic centimeter, and the entire absence of all sewage species. The results are often so satisfactory that the effluent water is nearly sterile, and in the best managed plants the limit here assigned is rarely exceeded. Manufacturers of mechanical filters now

LAYING BRICK—DETROIT.

usually guarantee to reduce the organic matter of water filtered by the use of their process to such an extent that albuminoid ammonia shall not exceed .150 part per million, and they also agree to remove at least ninety-six per cent of the bacteria from certain classes of water. In the reduction of so large a per cent of germ life, it is assumed that pathogenic species will be largely eliminated, and so the water becomes safer and



QUICK REPAIR WAGONS, SIDEWALK WORK, DETROIT.

more satisfactory for drinking; but no filtering process through sand can be an absolute safeguard for the use of purified water previously contaminated with human sewage. Safety in such cases can only come from the use of proper domestic filters, or by boiling all water used for drinking.

Satisfactory filtration usually reduces the number of species of bacteria to one or two, and entirely eliminates all liquefying and intestinal germs. But to do this requires the proper bacterial jelly on the sand of English filters, and the use of a coagulant, with proper time for its action before the water reaches the bed of mechanical filters. Sometimes satisfactory bacteriological results can be obtained from mechanical filters only by the use of settling compartments, such as are now attached to the best filters, for removing much of the clogging material before the water reaches the sand. But with some waters, bacterial purification is quite unimportant, so long as they have never received any sewage. They are filtered merely to remove suspended and coloring matter, that they may meet all æsthetic requirements, and be best prepared for manufacturing purposes.

METHODS IN DETROIT PUBLIC WORK.

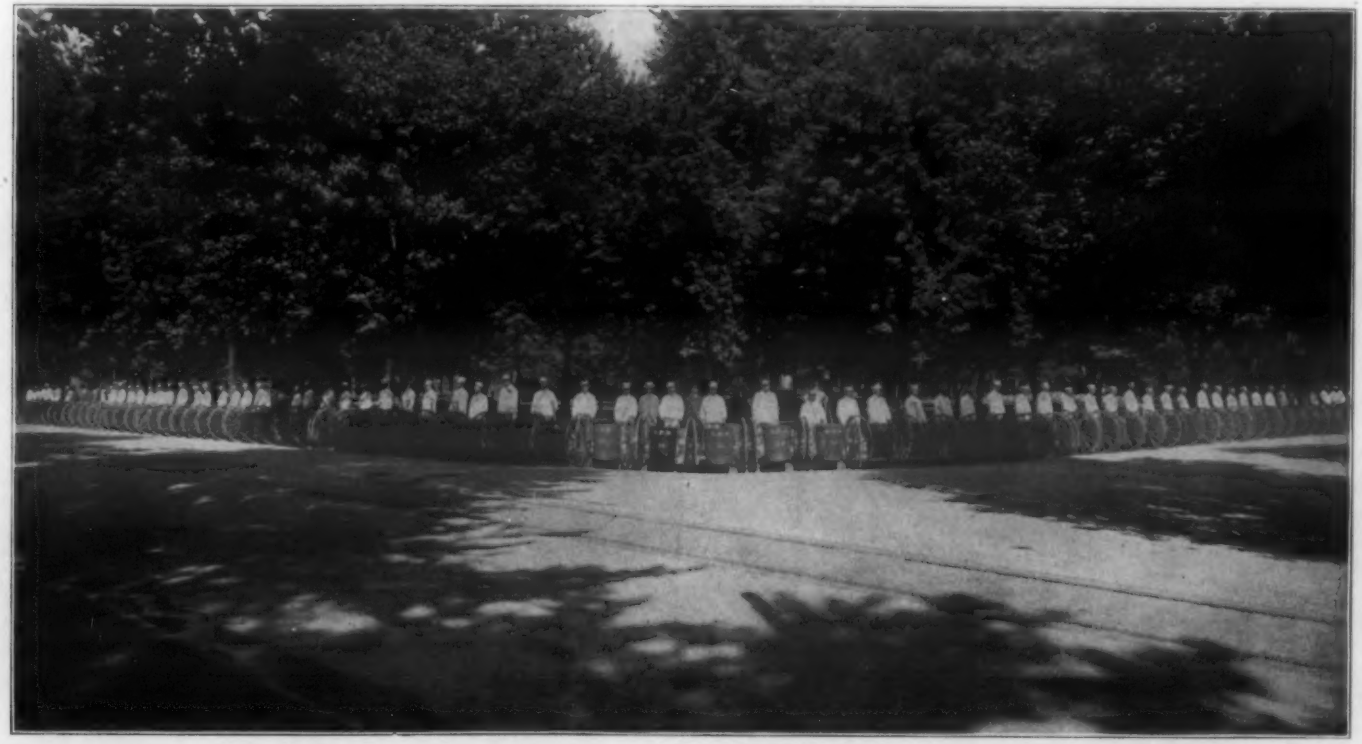
During the year ending June 30 the city of Detroit laid 2.53 miles of brick pavement in streets, 0.52 mile in alleys, 0.14 mile of granite and 16.11 miles of cedar block, including new work and repaving. Concrete is used for foundation in all cases. The contest over the right of the board of public works to name the brick to be used was settled in favor of the board, and brick paving was therefore somewhat easier to secure than for a year or two previous. A series of Ohio brick, including Nelsonville, Metropolitan, Athens, Union Paver, Buckeye,

LAYING ASPHALT—DETROIT.

and later the Bolen Brown Granite, makes a good list from which to choose. The admission of the new brick made a temporary reduction in price, but Elizabeth street bids were rejected as the price was run up to $1.90. No asphalt was laid during the year as the prices bid were unsatisfactory though bids on four streets were rejected no less than seven times. The admission of asphalt blocks into the competition for two streets reduced the asphalt price to $2.07 a square yard, which was acceptable, so that the paving of these two streets is now under way. Some improvement in curbing, both in material and in manner of setting, has been made during the year. The new work is all set in concrete and Medina curb is almost always used except in repaving where other stone was originally used, though granite, North River Bluestone and Woolmith curb are also in the list of those permitted. The series of small illustrations accompanying shows the various processes in street paving in progress, including making grade, setting curb, mixing concrete, laying brick, laying asphalt. One of the full-page illustrations shows the quality of brick paving done, being a view of Fort street West, near Clark avenue, paved with brick; another shows the improvement in Canfield avenue, near Cass avenue, paved with asphalt.

The building up of the city to the east has necessitated the expenditure of nearly $150,000 a year for sewers, large and small, in that district for the last two or three years. Practically all of the $113,521.63 spent last year was upon this system, $23,000 being payments on the contract for the uncompleted Dubois street sewer. Two illustrations show views of interesting constructions in this sewer, one showing the general section from Larned street to the river and the other the large bell mouth where three branches unite to form the large sewer.

The city paid over $39,000 during the year for repairs of asphalt streets, most of it under a repair contract running for several years which expires in about two years. The size of the repair bills is so great that the board of public works thinks the work can be done more economically by its own force. Ten thousand dollars has been appropriated therefore, for an asphalt plant to be used in furnishing material for such repair work, and it will be ready for use when the present



THE "WHITE WING" BRIGADE, SEVENTY-EIGHT STRONG, DETROIT.

repair contract expires. The result of this experiment will be watched with interest by other cities.

There are so many wooden sidewalks in the city that the draft upon the treasury for settlement of claims for damages for injuries said to be received on account of defects is very large. To keep the walks as nearly in perfect repair at all times as possible, a quick repair outfit has been provided which is ready on call to make the small repairs, which are so frequently necessary and which prevent the accidents attributed to small holes, single loose or broken planks and the like. One of our full page illustrations shows the two wagons in use. At present the full control of the sidewalks has not been assumed by the board of public works, and most of the new construction and the general repairs are made by the property owners, or at their expense upon failure to comply with notices. This division of responsibility for the actual work of construction is very expensive to the city in the way of damages for accidents, and the quick repair wagons are said to be very valuable and to save the city large amounts, and thus they are a partial solution of the difficulty which will relieve the situation somewhat until the board feels justified or authorized in putting sidewalks upon the same basis as street pavements.

Detroit is noted for its clean streets and the photograph of the "White Wings" army of seventy-eight will be of interest as showing the method used and the force required in the heart of the city. The broom brigade covers the rest of the city. For eight-hours' work the men receive $1.50. The entire expense last year was $144,500, an increase of $14,500 over the previous year. The increase for the year now passing will be $8,500. As the appropriations increase the field of the "White Wings" brigade is increased. While the report gives the expenditures for street cleaning in each ward, in detail, there is no report of the areas covered for paved and for unpaved streets and no comparison of expense with that in cities using other methods is possible.

AN ELABORATE SYSTEM OF RECORDS FOR A LIGHTING COMPANY.

By John Lyle Clough.

In making the award to the representatives of gas and electric lighting companies, who submitted samples of book-keeping blanks several months ago, the committee selected by MUNICIPAL ENGINEERING awarded a prize to James R. Shurtz of the Trenton Gas and Electric Company, and made special mention of the forms submitted by him, particularly referring to their fullness, and the care with which they were prepared before sending in. In point of fact, the blanks are so elaborate and comprehensive that it is not possible in any single magazine article to give more than a general survey of them, while many details of minor importance must be omitted entirely. This will be apparent when it is understood that the blanks submitted represent upwards of twenty different books, many of them very large and full, while there are approximately thirty-five minor blanks, all more or less intimately associated with each other, and with the larger bound forms. If any errors have been made in their preparation they have been in the direction of a too full and minute elaboration which necessarily entails needless labor and expense in their care. The stationery account of such a corporation must be an important one. The printer who is fortunate enough to secure the patronage of this particular company is entitled to full credit for having done his portion of the work most excellently. If a sufficient clerical force is provided to care properly for this set of forms, it would be difficult to cite any fact or figure relating to the transactions of the company which is not available, if one knows where to lay his hand upon it.

Among the minor blanks used by this company are the following:

An application for gas service of the usual form, a receipt for cash deposits from consumers and eleven different forms of slips of uniform size and arrangement, comprising orders for various classes of construction and other work in connection with the consumers' service, to which is attached by a perforated line a stub which is torn off and retained in the office when the order is issued to the company's employe who is charged with the work. The orders all relate to the "gas department" and their general nature will be understood from the heading of each, which is printed in heavy faced type. These headings are:

"Extend main."
"Service."
"Set meter."
"Change meter."
"Take index."
"Test meter."
"Miscellaneous work."
"Gas stoves."
"Take index and transfer."
"Miscellaneous street work."

While it is not practicable to copy them all, they are yet of sufficient importance to justify transcribing several of them here. The size of each slip, including stub, is four inches by nine inches, a size which admits of their being filed, and subsequently referred to with ease. The order for the extension of main is arranged as follows:

ORDER NO. .... GAS DEPARTMENT.
TRENTON GAS & ELECTRIC CO.
.....1900.

Extend Main.

Place.....
.....
Size of main.....
Depth laid.....
Pipe used.....
.....
Specials used.....
.....
.....
Work begun.....work finished.....
Done by.....
Cost per foot for pipe laid.....

ENTERED—Order book, Page....by....
Main record, Page....by....
(*over*)

(Stub.)

Order No..... .....1900.

Extend Main.

Name.....
Premises.....
Being done by.....
Order returned.....
Remarks.....
.....

(Reverse.)

Material		
Labor		
Total cost		

Location of.

The order for service connection reads:

ORDER NO.... GAS DEPARTMENT.
TRENTON GAS & ELECTRIC CO.
..... 1900.

Service.

Name.....
Premises.....
Size of main.....
Size of service.....
Pipe used.....
Fittings used.....
.....
Distance main to curb.....
Distance curb to cellar.....
Depth and condition of main.....
.....
Service drips towards.....
Date when done.....
Done by.....

ENTERED—Order book, Page....by....
Service record, Page....by....
(*over*)

(Stub.)

ORDER NO.... .....1900.

Service.

Name.....
Premises.....
Being done by.....
Order returned.....
Remarks.....
.....

(Reverse.)

Material		
Labor		
Total cost		

1. Location of tap in main.
2. Location of bends or elbows.

The order for miscellaneous work reads as follows:

ORDER NO. .... GAS DEPARTMENT.
TRENTON GAS & ELECTRIC CO.
.....1900.

Miscellaneous Work.

Name.....
Premises.....
.....
.....
.....
What done.....
.....

Material used.....
.....
.....
.....
Date when done .....
Done by.....

ENTERED—Order book, Page .... by ....
Page .... by ....
(*over*)

(Stub.)

ORDER NO. 1900

Miscellaneous Work.

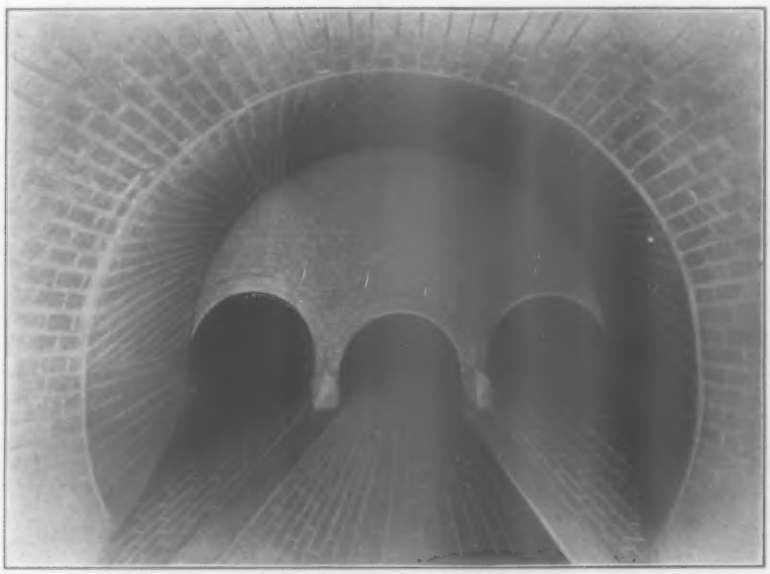
Name .....
Premises .....
Being done by.....
Order returned.....
Remarks.....

(Reverse.)

Material.....	....	....
.....	....	....
.....	....	....
.....	....	....
.....	....	....
Labor.....	....	....
.....	....	....
.....	....	....
Total.....	....	....

Remarks.....

It is not definitely stated how these blanks are to be filed. From their nature, however, it is evident that they must be easy of access at all times. That being the case they could be very much improved were they changed in form, size and weight, so that they could be adapted to the Card Index System. The Card Index is so generally understood, and has come into such wide popularity that its availability for such work as this will be readily recognized. It is true that the original expense would be somewhat greater than the cost of the blanks which are now in use, but with a large company which is obliged to keep an enormous amount of such records on file anyhow, the point of convenience is of first importance, and takes precedence of considerations of minor economies. No system of filing records that has ever been introduced compares with the Card Index System. No other system can be adapted to as many varying requirements, and no other system has ever before won as many warm friends in the same length of time. The particular blanks in question are not the only ones in use by the Trenton Company to which the Card Index System might be profitably applied, but mention of the others will be made later.



DUBOIS STREET SEWER, DETROIT. BELL MOUTH.

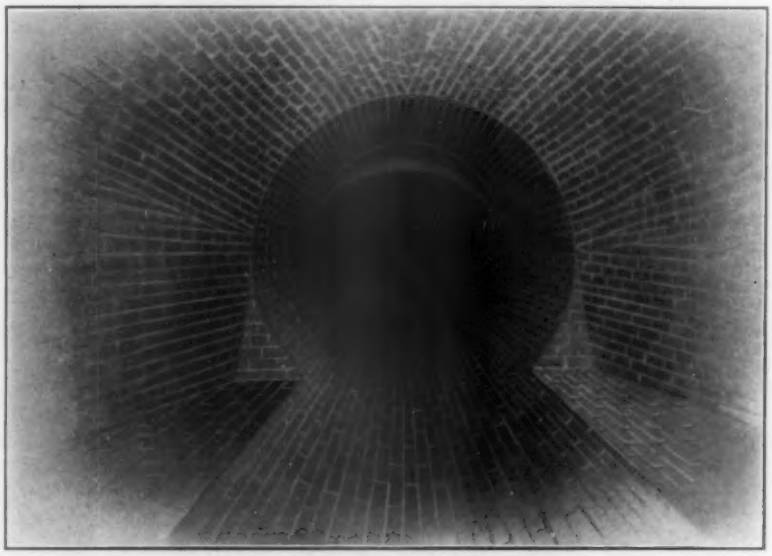
The other minor blanks submitted by this company, among them being meter books, gas range permits, collection books, etc., are not essentially different from those in use by other companies. The Trenton Company employs the voucher system in paying accounts of all kinds, and submits a form of voucher and receipt. The vouchers are de-

signed to be filed in numerical order, and on the back is a series of divisions for distributing the amount of the voucher among the various accounts to which it is to be charged. If this blank was made to combine the check and voucher in one it would be thereby improved. The advantage to be derived from combining the check with the voucher consists in the fact that it involves less labor in filling the form out, and the receipt is necessarily returned in every case because the check can not be cashed without the receipt having been properly signed; whereas, when the voucher and check are separate it is frequently necessary to write and re-write for the return of the voucher long after the check itself has been cashed. A description of the larger books used by the Trenton Company will be given in a subsequent issue.

THE SOLUTION OF ONE PROBLEM OF MUNICIPAL LIGHTING.*

By W. T. Hurd, D. D. S., Ex-Mayor, Boscobel, Wis.

In establishing a municipal lighting system the first problem that presents itself is the selection of a lighting system. Shall it be gas, either coal or acetylene, or electricity? In the majority of cases the decision will undoubtedly be in favor of the electric light, in which case you are confronted with a problem of considerable magnitude and carrying with it a great responsibility in its solution. Here you need the assistance and advice of a competent electrical and mechanical engineer. He should be a man interested not only in his own profession but if possible in favor of municipal ownership. He should be proficient in steam, as well as electrical engineering. The success of the plant comes through economy of operation rather than through economy of purchase. And it should not be forgotten, that the coal pile and the expense account are, like the poor, with you always, while the contractor gets his money and is gone.



DUBOIS STREET SEWER, LARNED STREET TO THE RIVER, DETROIT.

The first duty that should be required of the engineer whom you may select is the preparation of a careful estimate of the cost of your proposed plant, which estimate should be based upon a study of your local conditions. I do not think that any municipality can determine what is best for its particular needs upon any facts it may obtain regarding similar work in other cities. This engineering estimate should consider the present requirements and possible future growth of the lighting plant, both for the

*Read before Wisconsin League of Municipalities.

illumination of the streets and for commercial purposes. The several problems here to be taken up are: The best location of the plant, possibly with reference to the addition of a water-works system, the local conditions as to soil and the facilities for obtaining material and the costs thereof, and many other things that may not have influenced the construction at some other place. This estimate should outline the kind of apparatus, not necessarily the make, but the type, to be employed for the best results. Upon the plant as shown by this estimate, the engineer should show a careful estimate of the cost of operation. This estimate should consider local conditions as to fuel, water and labor, interest, maintenance, supplies and other things properly chargeable to a municipal plant. This enables the council to determine and to be convinced by expert advice of the savings to be expected by the establishment of a public lighting system. If the municipal plant is to supply commercial lighting, as well as the lights for the public streets, the engineer should determine as closely as possible the revenue that may reasonably be expected from such source. These estimates are of great value if prepared by a competent engineer; they enable the council to fix the amount of the appropriation for the purchase of the plant upon some basis of probable results, and not as is too often the case of the cost of the work at some other city where the conditions are probably very different. It may be stated, therefore, that an estimate of the cost of plant first obtained eliminates from the problem the possible error of making an appropriation too low and prevents the criticism that is likely to follow the effort to obtain more money in order that the plant as finally constructed shall meet the requirements of your city.

In the selection of an engineer the further fact that he is in no way connected with an electrical supply company should be considered; it will readily be seen that such a condition would involve, possibly, bias, and might lead to complications which should, if possible, be avoided. The right man will be able to smooth many of the rough places and "make the darkness light." Coincident with the work of your engineer, the problem of raising funds for the purchase of your plant presents itself. If you have not a sufficient amount in your city treasury, you will need to borrow. The course to be pursued in this event is, perhaps, clearly understood by all present. There are certain laws governing this process which you will need to follow, and which can be carried out under the direction of your city attorney; be sure to float your bonds before entering into contracts for your machinery and other necessary apparatus; if you do not you may be confronted with a problem quite difficult to overcome, especially if your city is working under a special charter.

It is always a good plan to know that your money is forthcoming before entering into contracts. When you have obtained the necessary money for the purchase of your lighting plant, the next problem confronting the council is the selection of the machinery, and contracting therefor. Here your engineer is again of assistance. He should prepare plans and specifications for your buildings, steam and electrical machinery, and line construction, make a map of your city showing the location of your street lights, and the pole line, for the information of bidders, and assist you in the selection of the apparatus by explaining such differences as are not plain in the propositions submitted for your consideration. A considerable, if not the entire responsibility of the selection of the proper apparatus is thus taken from the council, with the assurance that they have done that which is for the best interests of the city.

There are many other problems which confront you in the establishment of a municipal lighting plant. The selection of a competent light committee, the proper number to compose such committee, and the establishment of an ordinance setting forth the duties devolving upon such committee, whether it is better to select this committee exclusively from members of the council, or partly from members of the business men's association (provided you have such an association), or whether it is not best to select competent men regardless of their political or business associations, and to retain them just so long as they do their duty faithfully and well, are all questions to be considered. While these are perhaps minor problems, they must be considered and decided, but they are necessarily influenced by the local temperament, and must be solved by each city for itself. There can be no question, however, as to the advisability of divorcing the management of the municipal plant from politics, as a good manager should not be replaced by a good politician. A good engineer and electrician should hold his position as long as he produces good results, irrespective of his party affiliations.

HOW PROPERLY TO COLLECT AND DISPOSE OF GARBAGE.*

By H. P. Scherer, Mayor, Ft. Wayne, Ind.

I have thought it might be of interest if I were to explain to you the methods used in disposing of garbage by total incineration together with such suggestions as experience has taught us to be of importance and worth mentioning. Fortunately, I represent a city that owns its garbage crematory and has operated it successfully for the past five years, hence I am in a position to give facts and figures accurately, as a complete record has been kept of every detail pertaining to the collection as well as to the incineration of garbage, since the adoption of the system under which we are working at the present time. Prior to the year 1895, the collection of garbage and the disposal of same were absolutely unsatisfactory in every respect. The collection and removal was contracted for by the year, and the disposal of it simply consisted in hauling it a certain distance below the city and dumping it on low ground near the Maumee river. Farmers and others living near the city engaged in raising hogs would collect and remove a large quantity of the garbage and use it as food for hogs, while the city collector was expected to remove the rest. There was absolutely no system to this important part of the public service, and to say the least, it was very unsatisfactory.

During the early part of the year 1893 the common council appointed a special committee to investigate the merits of various crematories, to obtain prices, cost of running same, etc., with a view of purchasing one for the city of Fort Wayne, Ind. This committee visited Muncie, Elwood, Indianapolis, Ind., Findlay, Ohio, Pittsburg, Allegheny City and Scranton, Pa., and carefully examined into the merits and details of the plants in operation at these points. This committee recommended the purchase and erection of a plant guaranteed to incinerate all kinds of kitchen garbage, swill, manure and other stable refuse, night soil, sewer and catch-basin sediments; all kinds of dead animals; in short, every kind of refuse that contains organic matter, without emitting any dangerous or obnoxious gases or odors from the furnace or stack. Upon the completion of the plant the city was to be allowed to test it for a term of sixty working days, the capacity of the retort to enable it to incinerate from two and one-half tons to four tons per hour at a cost not to exceed the following for ten hours:

One man per day	$2 00
One man per day	1 50
One-half ton coal at $3.25 per ton	1 62½
Oils, waste, etc.	50
Total	$5 62½

The tests demonstrated that the crematory did not meet the requirements and guaranties of the contract, in that its capacity was less than one ton per hour instead of from two and one-half to four tons, that the consumption of fuel was four or five times greater than stipulated,—in short, it was an entire failure and was not accepted.

In May, 1895, a representative of the "Dixon Crematory" offered to put up a plant of their pattern of a sufficient capacity to consume all garbage, night soil, dead animals, and all combustible refuse matter that might accumulate in our city and require cremation, with a positive guaranty to incinerate the same without any disagreeable odors or offensive smell being connected therewith or escaping therefrom, the cost of buildings and plant complete to be $8,000. The board of public works, together with a committee of the common council, visited McKeesport, Pa., where a Dixon Crematory had been in operation some time. This plant was and had been doing good work to the entire satisfaction of the city authorities and citizens in general, without emitting offensive odors, or annoying citizens living in close proximity thereto.

The common council thereupon instructed the board of public works to contract for a Dixon crematory at as early a date as possible. By the terms of this contract the contractor guaranteed to incinerate twenty tons of garbage in ten hours, using not over one and one-half tons of lump or slack coal during that time, and that only one man would be required to perform all the labor required to be done in connection with the incineration of said twenty tons of garbage. The crematory was erected under the personal supervision of the board of public works, and upon its completion was subjected to a two weeks' working test, and after that to a special test, and was found to be in all respects up to the requirements of the contract, and to totally incinerate all kinds of garbage, dead animals and night soil without emitting any offensive odors about the building or in its vicinity. A record of the

* Read at Richmond Meeting of Indiana League of Municipalities.

special test lasting ten hours, held October 3, 1895, is as follows:

Garbage, fifteen tons, delivered at intervals.

Night soil, eight barrels, delivered at 10 o'clock A. M.

Horses, three, delivered at 2 o'clock P. M.

Coal consumed one and one-half tons in ten hours.

DAILY EXPENSE OF OPERATING CREMATORY.

One man per day of ten hours	$2 00
One and one-half tons coal per day of ten hours	3 60
Total	$5 60

Total cost per ton of garbage twenty-eight (28) cents. The plant was promptly accepted and has been in service ever since, giving the best of satisfaction.

The building is located on North Clinton street near Lawton Park, in an abandoned gravel pit owned by the city. It is a plain two-story brick building 45 feet square. In the basement are located the retorts, coal-bins, tool-rooms, while on the second floor (which is about on a level with the street) are the superintendent's office, and the driveways to the six openings in the retorts. The stack is seventy-five feet high, built of brick. Originally the basement only was constructed of brick and the second story, or that part of the building above the street level, was frame-work, the walls being covered with corrugated iron and the roof with slate. Sunday, November 12, 1899, the frame-work caught fire and the upper portion of the building together with a part of the floor was destroyed, the lower part and the retort and stack not having been damaged. Upon rebuilding the second-story brick was used, thereby making the building practically fire-proof.

Originally only one retort was placed in the building, the same being large enough to meet the demands at that time. However, the amount of garbage offered at the crematory steadily became heavier, so that instead of incinerating on an average 20 tons per ten hours (at certain times of the year) the retort would have to be in operation day and night and incinerate from 30 to 35 tons. This, of course, was a serious drawback to a successful and economical operation of the plant, as it prevented a proper cleaning out of the retort, the removal of all ashes, clinkers, tin cans and other incombustible material in a proper manner, thus shutting off a part of the draught and preventing a sufficient current of air from circulating in the retort. A natural consequence was that more fuel was required to destroy the same amount of garbage than would have been necessary under ordinary circumstances, and that by reason of the severe strain placed upon the retort in forcing it to do a greater amount of work than its capacity was originally intended for, repairs soon became necessary. A very important feature is to keep the grates as free from obstructions as possible, so that plenty of air, so necessary to combustion, can freely circulate through the garbage and retort, and also to prevent the burning out of grates, where cast-iron grates are used.

Upon the partial destruction of the building by fire the Dixon people were instructed to put in an additional retort of an improved pattern, with a capacity of about 25 tons per ten hours; to thoroughly repair the old retort, and to replace the cast-iron grates with fire-clay grates, as the latter are less expensive and last much longer than cast-iron grates do. We can now easily handle all garbage offered at the crematory without crowding the retorts at any time. One man can easily attend to all the labor required in operating the retorts, his work chiefly consisting of stirring up the garbage in the retorts so as to prevent it from banking and shutting off the current of air, and to instruct the drivers where to dump their loads. Three such attendants are employed, working in shifts of eight hours each.

Shift No. 1, working from 8 o'clock in the morning until 4 o'clock in the afternoon; No. 2, from four until midnight, and the third from midnight until 8 o'clock in the morning. The person in charge of Shift No. 1 was appointed the superintendent of the plant, and is held responsible for the proper operation of the plant and for the proper care of all property connected therewith. He, as well as the man in charge of Shift No. 2, attend to the burning of the garbage, while the third man has to clean out the retorts, remove all ashes, clinkers, tin cans and incombustible material, and get everything ready for the day-man to start the fires. Natural gas is used for fuel whenever the gas company can furnish it; at other times we use lump coal. So far we have not been compelled to buy more than from six to eight car-loads of coal per year.

Our method of collecting the garbage is as follows:

We aim to collect nothing but kitchen garbage. The larger dead animals, as a rule, are removed promptly by employes of a rendering establishment located beyond the city limits, while the city scavenger removes dogs, cats and other small animals to

the crematory. Owing to the universal use of natural gas we have no ashes to cart away, and night soil is disposed of through the sewer system. The following city ordinance governs the collection of garbage:

"GENERAL ORDINANCE NO. 124."

"AN ORDINANCE regulating the gathering and cremation of kitchen garbage, and the carrying away of tin cans and broken dishes, etc.

"Section 1. It shall be the duty of the board of public works of the city of Fort Wayne to provide for the collection and cremation of all kitchen garbage that may be furnished by residents of the city of Fort Wayne, except that of hotels, saloons and boarding-houses, and to haul away all tin cans and broken dishes, provided that the same is placed within the reach of garbage collectors, and to that end said board of public works is authorized and directed to secure competent and efficient men to collect and convey to the city crematory all such garbage at least twice each week, from the first day of May to first day of October of each year, and at least once a week for the balance of the year, and to likewise carry away tin cans and broken dishes, if collected in the manner herein provided.

"Sec. 2. That for the purpose of promoting the health and comfort of the citizens, and the cleanliness of the city, and preventing noxious and offensive odors therein, and for the purpose of facilitating and assisting the board of public works of said city in collecting, conveying and disposing of kitchen garbage, provided for in section 1, and for the carrying away of tin cans and broken dishes, it shall be unlawful for any person to throw out, empty or place on any lot, ground, street or alley in this city, any kitchen slops, vegetables or animal waste, paring, refuse or offal, commonly called garbage, at any time; but each and every person making, having or necessitating any such garbage herein designated, shall put the same and every part thereof, except the drainage, in a wooden box with tin, iron or metal lining and provided with a covering to keep out rain and snow; each box to be placed at a convenient place for city garbage collectors, either in alley or just inside fence or barn, out of reach of or disturbance of animals and vehicles, and every head of a family or other person occupying or having control or authority over, in or upon any place or premises where such garbage is made, except saloons, hotels, restaurants and boarding-houses, shall be required to see to the collecting, securing and depositing of all said garbage in the manner as in this ordinance provided.

"It shall be unlawful to mix tin cans and broken dishes, yard or house sweepings with kitchen garbage, but when tin cans and broken dishes are collected and placed in a box in a convenient place for garbage gatherers, the same will be removed, without expense to property owners.

"Sec. 3. Any person violating any provision of this section or failing or neglecting to perform either one or more of the duties herein imposed, shall upon conviction, be fined for any violation on any day or for each day of any such failure or neglect of duty, in any sum not exceeding fifty ($50) dollars.

"Sec. 4. All ordinances and parts of ordinances in conflict herewith are hereby repealed.

"Sec. 5. This ordinance shall be in force from and after its passage, approval by the mayor and legal publication."

Those parts of this ordinance that pertain to the collection of garbage have been printed on small cards and placed in the hands of collectors and sanitary policemen for distribution. Saloons, hotels, restaurants, business houses, etc., arrange for the delivery of their garbage, store sweepings and other combustible refuse at the crematory where it is handled in the same manner as garbage collected by city employes. The superintendent of the crematory reports the hour of the arrival of every load of garbage at the crematory, the character of the garbage, the consumption of fuel, and other desirable information, upon blanks gotten up for that purpose, using a blank for each day's work. In this way we keep a close and reliable record of the amount of garbage collected by each driver per day, the total amount consumed, the amount of fuel used, and other desirable data, from which we can easily determine if the work is being done in a proper and economical way. These reports are preserved and used in making up a weekly, monthly and yearly record and are of considerable value in various respects. As the crematory is located less than one-half mile distant from the heart of the city, the average haul for garbage collectors is not over one and one-quarter mile. The city owns eight dump wagons, the boxes being constructed of steel, water tight, and provided with iron covers or lids. The boxes of four of these wagons will carry about one and one-half tons of garbage each, while the other four are of a larger pattern carrying from two and one-half to three tons.

During the winter months (from November 1 to May 1) about four wagons can attend to the proper collection of all garbage, while during the summer months six wagons are required. A driver is employed who must furnish a good team of horses and harness. One of the dump wagons is turned over to him, for the proper care of which he is held responsible while it is in his charge, and he is assigned to a certain district, which he must cover twice each week, collecting all garbage, tin cans and broken dishes in accordance with the rules. He is strictly held to account for the proper performance of this work in his district. If any complaints reach the office he must explain the cause of same being made. A record of all complaints is kept in order to determine whether the collectors have been negligent or whether the garbage is offered for collection in a proper way, free from incombustible material and in accordance with the terms of the ordinance regulating the collection of garbage. If it is found that the garbage is not properly kept, a sanitary policeman is notified to order the tenants of the premises to remove it promptly at their own expense.

All tin cans, broken dishes and other incombustible material, as well as the ashes and clinkers from the retorts, are deposited about the crematory grounds and serve to fill up an abandoned city gravel pit. No attempt has been made at utilizing the ash as a fertilizer, the expense of sifting the ashes being greater than the value of the product. Wherever dead animals and night soil are incinerated with the kitchen garbage, the percentage of fertilizing properties contained in the ash will be much greater than it is with us, and no doubt it would pay to place it on the market.

Another important point not to be overlooked is that tenants of all premises where garbage is to be collected provide for a suitable garbage receptacle. An ordinary box without a cover, a basket, nail keg or old dish pan will not answer. The garbage box should be provided with a cover to keep out rain, snow and ice, and should be lined with zinc or galvanized iron so it can be easily cleaned and disinfected. Care should be taken that all water is drained off before the garbage is placed in the garbage box, as water-soaked garbage will only increase the fuel bills at the crematory, retard the incineration of the garbage proper and increase the tonnage of refuse to be hauled. It is very essential that the garbage be in as dry a condition as possible when reaching the crematory.

I herewith submit a summary of the records kept by us during the years 1896, 1897, 1898 and 1899, showing the amount of garbage collected and incinerated together with the cost of operating this department. Prior to February 22, 1896, no records were kept, hence the report for that year does not include the month of January and but seven working days during February:

Number of working days during 1896	262
Number of tons incinerated	3,685
Average per day 14 tons.	
Number of loads collected by city teams	2,477
Average per day 9½ loads.	
Cost of fuel per ton incinerated	38⅔ cents.
Cost of collecting per ton	77⅓ cents.

EXPENDITURES FOR THE WHOLE YEAR.

Total cost of collecting garbage	$3,368 45
Salaries of attendants at crematory (2 men)	1,019 84
New grates and castings	185 05
Natural gas	1,500 67
Coal	11 86
Salary of scavenger	144 00
Four new dump wagons and freight	921 00
Incidentals, tools, etc	56 11
Total expenditures for department	$7,206 98

Considering that this was the first year of the plant being in operation, and that in the list of expenditures, the cost of four steel dump wagons, amounting to $921, is included, the results were quite gratifying.

The record of the year 1897 is as follows:

Number of working days	304
Number of tons incinerated	5,235
Average per day 17 1-5 tons.	
Number of loads collected by city teams	2,710
Average per day not quite 9.	
Cost of fuel per ton incinerated	.27 cents
Cost of collection per ton	.64 cents

EXPENDITURES.

Salary, collectors and scavenger	$3,349 60
Salary, attendants at crematory (2 men)	1,020 00
Fuel	1,409 64
Two new dump wagons	450 00
Repairs to other dump wagons	31 75
New grates, rings, covers and other castings	175 94
Repairs to retort, fire-brick, fire clay, labor, etc	27 15
Repairs to tools and incidentals	21 95
Total cost of the department	$6,486 03

Among these expenditures is an item for

two new wagons amounting to $450. These wagons are of a larger pattern with a capacity of carrying considerably more garbage than the smaller ones. All garbage wagons should be constructed with a view of carrying as large a load as the locality and other circumstances will permit, a good, heavy team of horses to handle properly, for a great deal of time is lost to the collectors in driving from their district to the crematory and back again, particularly to those who are assigned to districts quite a distance from the plant. We found that the first wagons we purchased were too small, hence, the board of public works had larger ones built in accordance with their own ideas. A consequence was that quite a saving was made in the cost of collection. You will also note quite a saving in fuel over the previous year, considering the increased amount of garbage consumed while the items of repairs are hardly worth mentioning.

RECORD OF 1898.

Total number of working days	307
Total number of tons incinerated	5,421
Average per day 14½ tons.	
Number of loads collected by city teams	2,500
Average per day a little over 8.	
Fuel per ton of garbage incinerated, 32 cents	
Cost of collection per ton	67 cents

EXPENDITURES.

Salaries of collectors	$2,973 75
Salaries of attendants	1,050 00
Salary of scavenger	144 00
Fuel	1,751 18
Repairs to building	43 42
Repairs to retort	9 80
Repairs to wagons	57 90
New castings	148 56
Tools and sundries	93 55
Two new garbage wagons	425 00
Total for department	$6,697 16

Our records for 1899 do not cover the whole year, as the buildings were partially destroyed by fire November 12th, and were not again put in operation during the year.

The record made during the 260 working days is as follows:

Total number of tons incinerated, 5,487.

Average per day, 21 tons.

Number of loads hauled by city teams, 2,275.

Average per day, 8¾.

Cost of fuel per ton of garbage incinerated, 33¼ cents.

EXPENDITURES.

Salaries, collectors for whole year	$3,085 02
" attendants " "	1,089 94
" scavenger " "	144 00
Fuel	1,824 36
Repairs to building	160 70
Repairs to wagons	41 50
Repairs to retort	9 56
New castings	172 18
Tools and repairs	13 50
New scavenger wagon	85 00
Total expense of department	$6,625 76

The increase in the expense of castings was due to the rise in the price of iron, while the item of repairs to building was made necessary by reason of the corrugated iron covering the outside of the walls of second story giving out, and having been replaced with slate.

The cost of reconstructing the plant amounted to nearly $4,900. This includes all changes and repairs made to the building and old retort, a new retort, an addition of twenty-five feet to the top of the smoke-stack, plumbing and other incidentals, so that the plant is in better condition than ever before.

Taking into consideration the satisfactory work it had been doing prior to the improvements being made, we may expect to obtain better and more economical results in the future. When the plant was originally erected the improvements made were in some respects of a temporary nature, owing to a desire to more fully test the system of incineration with as small an outlay of money as possible. Now, however, after having operated under this system for a period of five years, and having found it to be highly satisfactory, all improvements were made with a view of permanency.

We do not anticipate that heavy repairs or larger sums of money will be required to keep the plant and everything connected therewith in a first class condition for years to come.

Again I wish to say that I am convinced that the disposal of garbage by the crematory system is the only one that should be considered, for it is the only system by which garbage is totally destroyed, and it is also the most economical method by which garbage can be totally destroyed.

UNIFORM MUNICIPAL ACCOUNTS AND REPORTS.*

By M. N. Baker, New York City.

Having had occasion, in the past twelve or thirteen years, to examine many hundred annual water-works reports and to edit some thousands of special written reports for "The Manual of American Water-works," I feel sure of my ground when I state that the financial accounts and general records of most of the water-works of the United States are in a deplorable condition. It is an exceptional annual report which will enable a citizen and taxpayer to get a clear idea of the character and extent of the works supplying him with water, and rarer yet to find a report which exhibits clearly the financial status of the works, including cost of construction and operation and the revenue from various sources. This may seem like exaggeration, but it would not take an expert accountant long to prove the truth of these assertions from eight out of ten water-works reports chosen at random from almost any section of the country. Some reports make no pretense of giving any information except a more or less brief account of the work of the year, a summary of receipts and expenses (often very poorly classified) and perhaps an inventory of material and tools in hand. Such reports are likely to be of little use to the officials who make them and of practically no value to the taxpayers. In future years they will be almost worthless, because quite unintelligible without recourse to their authors for explanation, and because the successive reports do not follow the same plan.

Obviously, if a report is of little or no real use in the community to which it relates, it can not have much value for outsiders. Of course, water-works and other municipal reports are made primarily for the city or town directly concerned, but this age is notable for the interchange of ideas and experience between individuals, corporations and municipalities, as is witnessed by the very fact that this association has sprung into existence and met with so much success. A common language and common units are needed for an interchange of ideas, and so are uniform systems of accounts and reports for an interchange of experience among water-works men. One water department charges the substitution of a 10-inch for a 6-inch main to construction and another charges it to operating expenses; one city reports its coal consumption in long tons and another in short tons; one town sells water by the hundred cubic feet and another by the thousand gallons, or one bases its rates for unmetered water on the number of persons in the family, another on the number of rooms in the house, its width or height. These are only a few of the scores of variations in water-works records and reports with which anyone must struggle who attempts to compare one water-works plant with another.

These deficiencies, kaleidoscopic changes and general lack of uniformity from year to year in a given city and between the departments of different cities are by no means confined to water-works. In fact, probably water-works, as being one of the oldest and best-managed class of public works, are superior in their accounts and reports to most other branches of municipal activity. But it is of no avail for the pot to call the kettle black, unless, indeed, it results in a general awakening to the facts of the case and concerted action to secure a reform.

I wish to be brief, and now I have come to my point. There seems to be, just at present, an awakening to the fact that municipal affairs in general are in bad need of reform, and that heterogeneous accounts and a lack of data for comparing the results attained in one city with the achievments of another are at the bottom of much of our trouble. Our cities are getting to be like merchants or manufacturers that have embarked in one venture after another without even stopping to take a full inventory of stock, draw off a correct balance sheet or look about to see what others in the same line are doing. One of the greatest troubles with our cities, heretofore, has been that instead of balancing accounts and taking stock, they have gone blindly on, or at least have contented themselves with sending off a committee of councilmen to see how some other city was solving the particular problem in hand, not realizing the fact that while their neighbors might have launched a venture not yet tried by themselves, the chances were that through lack of proper accounts its financial success or failure could not be determined. The sum and substance of the whole matter is that you can not learn from others, or others from you, unless there is exact knowledge on the respective sides regarding the methods in vogue

*A paper read before the Central States Water-works Association, at Columbus, O.

and the results obtained, and even then little can be gained unless the methods and results are readily comparable.

It is because of the facts outlined thus briefly that movements have started in many quarters of late to secure uniform municipal accounts and reports. I shall not weary you with a review of these efforts and the results obtained.

The steps thus far taken fall into three classes: (1) The work done by societies like this, in the adoption of uniform schedules to be used by members in keeping accounts and records and particularly in making up their annual reports; (2) state supervision of all municipal accounts, through an auditor or similar state officer; (3) state control of specific industries by commissions, like the Gas and Electric Light Commission of Massachusetts.

There is much to be said in favor of both (2) and (3), but I do not propose to say it now. The Ohio Municipal Code Commission, in its recent draft of a new code, provided for a director of accounts in each city and for the state control of municipal accounts.

As to (1) a uniform schedule for water-works' accounts and reports, it falls directly within your province, and precedents have been set by the New England and the American Water-Works associations. I name the New England association first, because, although each organization adopted such a form some fourteen years ago, only the New England plan, so far as I know, was ever put into and continued in use. Doubtless many of you have seen the valuable summary, in accordance with that form, in the water-works reports of Concord, N. H., Burlington, Vt., New Bedford, Mass., Woonsocket, R. I., New London, Conn., Yonkers, N. Y., Oberlin, O., and Bay City, Mich., to name only a part of the cities that have adopted it.

A schedule for water-works' reports was formulated by the Committee on Data of the American Society of Municipal Improvements two years ago, but I do not know that it has been used by any works as yet.

I trust your association will take this question into consideration and give its aid to the good cause of proper and uniform accounts and reports. While your chief interest is in water-works it is desirable that your committee, in case you should see fit to appoint one, should be so constituted and authorized that it might co-operate with similar committees from other societies to forward the general scheme of uniform accounts in all branches of municipal activity. It is also desirable that the scope of all such committees should permit united action in behalf of the collection and publication of National Municipal Statistics, by a permanent census bureau, the United States Department of Labor or some other government agency.

THE POLLUTION OF PUBLIC WATER SUPPLIES IN THE UNITED STATES.*

Since 1894 your committee on the pollution of public water supplies has devoted most of its efforts to matters of an analytical nature. From the beginnings then made, and with the aid of a large number of laboratory workers, there have resulted the publication of a Report on Bacteriological Methods, which is widely used in this country and well thought of abroad, and the establishment of a section of bacteriology and chemistry.

The analytical phases of water pollution problems having been delegated to committees under this section, the present committee returns to topics of a more general nature.

It was decided by this committee that, for the present meeting at least, our report should take the form of records and summaries showing recent progress in the more important branches of the subject assigned to us. Accordingly, a series of topics was allotted to the individual members for the preparation of the available evidence; and the general report presented herewith consists of a summary of the material accumulated in this manner.

The president and secretary of the association requested this committee to take steps to bring out a thorough discussion of this general subject from the standpoint of the engineer, the analyst and the health officer. This request has been complied with so far as practicable.

*Report of a committee of the American Public Health Association presented at the Indianapolis meeting, October 24, 1900, Geo. W. Fuller, New York, Chairman.

I. — WHAT CONSTITUTES A SATISFACTORY WATER SUPPLY IN THE LIGHT OF OUR PRESENT KNOWLEDGE?

Expressing in brief terms the leading features of Mr. R. S. Weston's paper, it may be said that the modern water supply must provide under adequate pressure a sufficient quantity to meet liberally all legitimate use and unavoidable waste, of water which is either originally pure and wholesome, or which has been rendered so by some process of purification. With regard to quality, the water supply of the future should meet the following requirements:

(a) It shall be free, or substantially free, from disease-producing germs.

(b) It shall be clear and colorless, or very nearly so, containing no objectionable turbidity or vegetable stain.

(c) It shall be free from objectionable stains and odors as supplied to the consumer.

(d) It shall be free from noticeable amounts of dissolved iron, such as unfit it for household use.

(e) It shall be free from excessive amounts of lime and magnesia, such as make a water too hard for ordinary use.

(f) It shall be carefully examined with regard to constituents capable of dissolving metals used in distributing pipes, and this information in connection with the pipes employed should result in such steps as are necessary being taken to guard against complications of this nature.

To many of you these brief facts will seem very trite. It will appear that they represent what has been sought by the foremost sanitarians and water-works men for years, and, if not obtained in practice, it has been because the actual results accomplished in many places have been limited by financial or other important local considerations. In a measure your committee recognizes this fact, but it desires at the same time to point out that recently there has been a marked change in public opinion in this respect. Many water supplies which were apparently satisfactory ten or fifteen years ago are unsatisfactory to-day; and there are supplies which are claimed by municipalities to be suitable now which will not be so ten years hence.

In presenting to-day for your consideration and discussion a progress report upon this important topic, it is not the desire of this committee to see the time occupied in an exact definition or specification of the ideal or thoroughly satisfactory water supply. This general information is so well known to you all that further details are unnecessary. It is the hope and intention of the committee, however, to see the discussion focus upon the actual issue of the day, namely: How nearly must the future water supply approach the ideal in point of quality, in order to satisfy the modern water consumer, and what are the recent advances which have been made towards securing this end?

It is very gratifying to be able to state that very substantial progress has been made since a general survey of this topic was last made to the association. The progress may be divided into two distinct classes. The first relates to changes in public opinion as to the character of water which consumers are entitled to receive. The second is connected with improvements in physical processes necessary to satisfy the demands of the more intelligent citizens.

At the present time there is a considerable portion of the inhabitants of the various centers of population which recognizes clearly that they are entitled to a water supply which shall not transmit to them water-borne diseases. A smaller proportion of water consumers, but aggregating numbers far greater than most people realize, considers that a water supply should also present a first-class appearance with regard to freedom from turbidity and discoloration from iron and vegetable stains. In support of this advance in public opinion, it is only necessary to point to the fact that within the past ten years, over forty of the larger American cities have given active consideration to the improvement of their water supplies, chiefly on the ground of quality. Another fact which speaks volumes in itself is the growing custom among the better class of water consumers of attempting to improve the quality and appearance of the supply by the purchase of water from peddlers, or by household filters, or both. When this rapidly-growing class of water consumers reaches an effective majority in their respective communities is the time when it will be imperative that the quality of water supplies shall equal or approach very nearly to the ideal, as noted above. The present trend of affairs, however, indicates that in a great many instances this date will be discounted by water-works officials in their desire to maintain public works in touch with the best thought of the times.

Until quite recently water-works officials answered criticisms concerning the quality of their supplies by the legitimate statement that it was impracticable for them to secure a supply which in its natural condition was perfectly satisfactory, and that there was

not enough information concerning purification processes as to cost and efficiency to justify large expenditures. The truth and significance of this statement with reference to supplies of unpolluted, clear and colorless water will increase each year. With regard to methods of water purification, the day has gone by when this statement alone can properly be made. While the original water should be as free from sewage pollution as practicable, it may be definitely stated that it is now possible after study of local conditions to purify almost any water in a satisfactory manner, and at a reasonable cost, although some waters are so bad as to make their use inadvisable when other supplies can be found. The special field of water purification is discussed beyond. But it may be added here that the total cost of purification ranges ordinarily under different local conditions, only from about 20 to 50 cents per capita per annum, a mere fraction of the cost of spring water and other waters now freely bought from private sources. The range in cost is largely due to differences in the amount of water which is illegitimately wasted. In fact, the needlessly large consumption of water in most American cities is one of the chief drawbacks to improvement of the quality; and the sooner public opinion assists in restricting the waste, the sooner will the consumers have better water.

In brief terms it may be said that the current evidence indicates that as a general rule the surface waters for the future supplies of this country should be taken from as unpolluted sources as practicable and should be properly purified (including clarification and decolorization); that excessively hard waters should be softened; and that ground waters should be freed from dissolved iron if present beyond slight amounts.

II.—ON THE VALUE OF VITAL STATISTICS AS AN INDEX TO THE POLLUTION OF WATER SUPPLIES.

Twenty years ago it was considered that the chemist, after making a few analyses, could render a positive and unqualified decision as to the hygienic character of any water. In making his decision he was usually aided more or less by a series of arbitrary standards of purity, based on evidence from a limited number of types of water. With the advent of the germ theory of disease and the new science of bacteriology, the position of the water chemist became less autocratic. There followed a period of doubt in the minds of many, due in part to the added knowledge coming from a wide range in the types of natural waters.

At present it is to be stated that the modern water analyst should be skillful in the application of both chemistry and biology, apart from the very important role which he is destined to play in the future with reference to purification processes. It may now be said that, after he has secured the needed analytical data, he can tell definitely whether the quality of a given water for domestic use is very good or very bad. With regard to that large intermediate class, conventionally called "suspicious" waters, and which may be used with moderate safety for years, or which, without warning, may cause a typhoid fever epidemic at any time, the position of the analyst is far less sharply defined.

Leading sanitarians agree concerning suspicious waters that, while the work of the analyst is very important, final conclusions should be based not on his data alone, but in conjunction with the results from sanitary surveys of the source of supply and with the vital statistics of the water consumers.

The value of vital statistics in this connection is clearly stated in the paper by Dr. A. C. Abbot, who concludes that "of the data relating to suspicious water supplies, those which are most trustworthy and constant in their indications are the regularly recorded vital statistics of the community using such water."

III.—COMPARATIVE STATUS OF THE WATER SUPPLIES OF THE LEADING AMERICAN CITIES, AS SHOWN BY TYPHOID FEVER STATISTICS FOR THE LAST TEN YEARS.

These valuable data are frequently sought for by sanitarians in connection with various studies. Although many of the records have been compiled in various publications, it is usually difficult in many instances to bring them up to date without considerable time and labor. It is thought by the committee that it would be well to establish the custom of including in our reports each year complete records, as a matter of reference, of typhoid fever rates for leading cities from 1890 up to the current year, as far as practicable.

This time-consuming task has been undertaken for the committee by Mr. J. J. MacKenzie, who sent out circular letters to secure these data for all cities of over 10,000 population. This information in satisfactory form has been obtained for the cities in the states of Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Ohio and Michigan, as well as for quite a number of the larger cities in other states. Delay in securing the returns of the recent census makes it impracticable

to present this evidence to-day, although it will be in readiness to be included in the forthcoming annual publication of the association.

IV.—ON THE CONSERVATION AND CONTROL OF WATER SUPPLIES BY STATE, PROVINCIAL AND MUNICIPAL AUTHORITIES.

This general topic is a very broad one, and one of the most important coming before the association for consideration. Under present arrangements there is some uncertainty as to how the subject had best receive the attention which it deserves. This is largely due to the fact that it relates to the work of several committees, notably that on public health legislation.

To the thought of your committee on the Pollution of Public Water Supplies, it would be very desirable to make this topic the subject of special discussion at the next meeting of the association, and it herewith makes recommendations to that effect. The most suitable manner in which such a discussion could be taken up is a question which requires attention.

This committee has devoted some time to the collection of evidence upon this subject, to serve as a matter of reference and also to facilitate discussion to-day and at your future meeting. The evidence, so far as it is available, is presented in the paper by Dr. F. F. Westbrook.

V.—ON THE RELATION OF THE ANALYTICAL LABORATORY TO PROBLEMS IN THE POLLUTION OF PUBLIC WATER SUPPLIES.

Ten years ago the analytical laboratory for a number of reasons occupied a rather uncertain position with reference to water pollution problems. So far as systematic work was concerned, it was then confined largely to the labors of the state boards of health of Massachusetts and Connecticut, although analytical data on special problems were obtained by various authorities from time to time, and the water supplies of a few of the large cities were analyzed quite regularly.

Since 1890 there has been a rapid advance in the amount of analytical data secured each year, relative to problems in water supply and sewage disposal. This is especially true with regard to purification plants and processes and various special problems. At this time it is gratifying to note that there is a growing appreciation of the value of analytical data, and that the true position and scope of laboratory work is being more correctly understood. During the past ten years there have been established more than twenty new laboratories in this country, in which the analysis of water and sewage forms a prominent feature. Further, there is a growing number of state and local authorities which avail themselves frequently of private laboratories or those of educational institutions.

The details concerning the growth and present relation of the laboratory in this line of work will be presented by Dr. Wyatt Johnston.

VI.—ON THE LEGAL ASPECTS OF WATER POLLUTION.

Each year sees an addition to the accumulating evidence upon the legal aspects of water pollution. To many sanitarians and water-works men this is a subject which presents to them considerable interest from time to time. It is the intention of this committee, as time allows, to present in condensed form the leading features of the more prominent court decisions in this connection. The purpose of this will be principally for reference, rather than for detailed discussion.

Beginnings toward this end have already been made by Dr. J. L. Leal. At this time, however, there is little to be said, in the form of a summary, with regard to general progress in this direction.

VII.—SUMMARY CONCERNING SEWAGE PURIFICATION PLANTS NOW IN OPERATION IN AMERICA.

It appears that there are now in operation in America several hundred sewage purification plants, ranging in size from those for cities of more than 100,000 inhabitants down to those for small institutions and summer hotels. With regard to the larger ones the available information indicates that there are about 75 which treat the sewage of about 500 persons or more. Many of these plants were installed to reduce the pollution of public water supplies, while a large number are operated with the view to obviating nuisances, such as would arise from putrefactive changes in the bodies of water into which the effluents are discharged.

More or less information of a general nature concerning many of these plants is available, through official reports and articles in professional and technical journals. Detailed and specific information upon various points of importance, however, is for the most part confined to the larger plants in Massachusetts, which have been studied by the board of health of that state. Compilations of the leading published information available from the larger plants

have been made by your chairman, supplemented somewhat by personal inspection and by correspondence. While as yet the amount of directly comparable data is too meager to warrant a detailed presentation, yet these comparisons bring clearly to light a number of points of general interest and of suggestive value. Some of them will be noted, to facilitate your discussion to-day.

The point upon which our knowledge has been most advanced through data coming from sewage purification plants in actual practice, seems to be the composition of sewage. For years it has been known that the composition of all sewages varies widely at different times, and that American sewages are much more dilute than those abroad. It is the amount of suspended organic and mineral matters in a sewage which usually gives the best index to its composition with reference to purification. The reasons for this are that suspended mineral matter becomes a sludge which after greater or less accumulation requires removal by physical means at considerable expense; while the suspended organic matter is the chief factor of difficulty in processes for thorough purification, from the standpoint of both cost and efficiency. There are at least twelve places in this country where such information has been obtained with sufficient frequency to yield results which may be used as approximate averages. As a matter of reference, these results, taken from the reports of the state boards of health of Massachusetts and Connecticut, are given in the following table, beyond which are corresponding results from European sewages:

Record of Average Suspended Matters in Some American Sewages.

Parts per 1,000,000.

Places.	Yrs.	Total.	Mineral.	Organic.	*Per cent.
Brockton, Mass.	'97-8	120	23	97	81
Chicago Exposition.	'93	182	29	153	84
Framingham, Mass.	'93-8	1,354	154	1,210	89
Gardner, Mass.	'92-8	134	31	103	77
Lawrence, Mass.	'88-9	240	102	138	51
Leicester, Mass.	'97-8	106	25	81	77
Marlboro, Mass.	'92-8	201	53	148	74
Medfield, Mass.	'94-8	107	26	81	76
Meriden, Conn.	'97-8	120	38	82	68
Natick, Mass.	'97-8	23	12	11	45
Spencer, Mass.	'98	95	13	82	87
Worcester, Mass.	'93-4	212	99	113	53
Total average.	——	242	50	192	79
Total average, except Framingham.	——	140	41	99	71

With regard to the fundamental principles which control the operation of plants in practice for the purification of sewage by irrigation or intermittent filtration, the most comprehensive statement which can now be made is to the effect that the available evidence, so far as it goes, testifies to the soundness of the laws which were formulated at the Lawrence Experiment Station. In fact, there are some indications that somewhat better results may be expected in practice than have been obtained from the experimental filters, other things being equal.

*Which organic is of total.

Record of Average Suspended Matters in Some European Sewages.

Parts per 1,000,000.

Place.	Authority.	Total.	Mineral.	Organic.	*Per cent
Average, 16 English water-closet towns.	(†) ..	447	242	203	45
London, '94	Dibden.	450	...	...	..
Sutton, '99	Rideal.	609	...	...	..
Leeds,	City Doc'mt.	331	...	...	..
Accrington, '99	Naylor.	505	205	300	59
Danzig,	Koenig.	582	226	356	60
Berlin,	Koenig.	1,085	383	702	65
Breslau,	Koenig.	405	205	200	49
Halle,	Koenig.	594	189	405	68
Frankfort,	Koenig.	1,193	387	806	67
Leicester, '98-9	City Doc'mt.	624	...	...	..
Salford, '92	Vogel.	512	144	368	72
Cassel,	Hoopner and Paulmann.	5,460	1,246	4,214	78

For a high degree of purification of sewage entering small, short feeders to public water supplies, there is no evidence to indicate that this can be accomplished in a better manner than by intermittent filtration. The cost of this treatment depends largely upon local conditions. Where ample areas of suitable land are readily available at a low cost, as is the case in many places in New England, first-class results can be obtained at the least cost by this method in its simplest form. But where suitable land is very scarce and expensive, or where filters would have to be built of selected material brought from a distance, the indications are that economy demands that the sewage receive a preliminary treatment, so as to allow of higher rates of filtration. Such preliminary treatment relates of course to clarification of the crude sewage, or, in other words, to the removal of the suspended matters which exert such a troublesome clogging at the surface of the filters.

Much study for many years has been given to the clarification of sewage as a preliminary step in its purification, and the problem is still an open question. During the past few years the so-called septic tank system has been much talked about in this connection. Although this procedure is being tried on a greater or less scale at ten or eleven different places in this country, comparatively little is now known in definite terms concerning its practicability under various known conditions as to the sewage treated and details of devices employed. Opinion as to its merits is widely at variance. Some very erroneously appear to re-

*Which average is of total. †River Pollution Com.

gard it as a complete purification process by itself, and a successful solution of the difficulty of final disposition of matters suspended in sewage. Others seem to question its practicability on the basis that there will be a large accumulation of sludge in the septic tank, involving much expense for its removal as well as nuisances due to bad odors.

Whatever the future may show to be the true merits of the septic tank, it is certain that it can never afford a final disposition for the suspended mineral matter in the sewage. This is a point of much significance, as the mineral matters form from 20 to 40 per cent., and sometimes 50 per cent., of the solids in suspension.

With regard to filtration of sewage at comparatively high rates, to secure moderate purification for cases where the effluents are very indirectly or not at all connected with public water supplies, there is very little evidence from actual operations in this country. In general terms, it would appear that success in this important field will be associated, to a considerable degree, with the freedom from suspended matters in the sewage as it reaches such filters. It is felt that much more information is needed in this branch of work before large plants can be built with confidence as to permanency and economy.

VIII.—ON THE PRESENT STATUS OF METHODS OF PURIFICATION OF WATER SUPPLIES, WITH A SUMMARY OF PLANTS IN OPERATION IN AMERICA.

Of the various branches of public works connected with the pollution of water supplies, there is none in which such substantial progress has recently been made as in water purification. Ten years ago our information upon this subject was very meager, and comparatively few plants were in operation. During this period English sand filter plants have been increased from about 1.5 to 19 acres, with respective nominal capacities of about 4,000,000 and 37,000,000 gallons daily; and the American, or mechanical filter plants have been increased from about 12,000 to 90,000 square feet, with respective nominal capacities of about 36,000,000 and 270,000,000 gallons daily. Projected plants for some of the largest cities in the country show that in the next few years there will be very rapid development in the application of both of the leading methods of purification.

Concerning the large fund of technical knowledge relative to the efficiency and cost of water purification which is readily available from various books, reports and professional and technical journals, it is needless to touch upon them in this report of progress. An adequate statement of the general situation at this time will be found in the paper by Mr. Allen Hazen. With regard to the leading generalization which can be made at this time, leading workers in this subject agree upon the following:

(1) Of the various processes mentioned for the purification of water supplies, there are two general methods which have shown distinctly their practicability, namely, the English method of slow sand filtration and the American method, employing rapid mechanical filters.

(2) Each of these methods has its distinct advantages for particular cases, as well as its disadvantages for others; and there is no doubt that each has a large field of usefulness.

(3) For those waters which never possess more than a slight or moderate amount of turbidity or dissolved vegetable color, the English method of sand filtration is somewhat more efficient; and as a rule it is slightly the cheaper for such waters.

(4) For those waters which for long periods at a time contain excessive quantities of either finely divided clay or of dissolved vegetable matter, there is now no practicable method of purification without the use of coagulants and subsiding basins. It is the concensus of opinion, however, that coagulants should not be employed where it is practicable to secure satisfactory results without them.

(5) While coagulants can be successfully used in connection with the English method of sand filtration, in those cases where coagulants are imperative the American methods as a rule yield somewhat more efficient and economical results.

(6) Many of the purification plants now in operation in this country have not shown as high efficiency as is reached by some of the better ones, and as may be expected from those now about to be built. This is due in part to their construction, and in part to their management, the latter point applying particularly to mechanical filters.

(7) While there has been rapid progress in the past four years in discovering the controlling laws of purification and in the establishment of certain types of filters, there are indications which go to show that material progress and improvement may be expected for some time to come.

IX.—CONCERNING RECENT PROGRESS IN EUROPE IN MATTERS PERTAINING TO THE POLLUTION OF PUBLIC WATER SUPPLIES.

This broad field is so well covered in the most important points through various reports, books, and journals available to the members of the association, and is so well known to many of you through recent visits abroad, that there is little to be said at this time by your committee.

Several members of this committee, however, have been interested in securing information relative to the present governmental control of water pollution in Europe, and the procedure employed in accomplishing practical results. A summary of this information will be reported upon at a future meeting.

With regard to water purification in Europe, the most striking feature is the efficient manner in which the plants are operated. This is due in part to the long experience, with each particular water, of technically competent men; and in part to the scientific control and supervision both on the part of the water-works' officials and of other authorities.

European experience in water purification covers a much narrower range in types of water than has been carefully investigated in America, and can supplement but very little the leading evidence now available in this country. Concerning the purification of waters highly charged at times with algae and similar growth, the present evidence is almost wholly confined to European experience.

The subject which of course is of most interest to the greater part of American sanitarians, relates to recent developments in England with septic tank and high-rate filters in the purification of sewage. To a majority of Americans who have made personal inspections at leading English cities it would appear that developments are rather disappointing, and still lacking in thoroughness in some essential features. To the thought of some of the foremost sanitary engineers in England it is yet too early to conclude that the past ten years have shown any substantial improvements in England in methods of sewage disposal. The majority of English sanitarians take a far more hopeful view than this, and consider that rapid progress has recently been made, especially in our knowledge of the underlying principles of bacterial purification. It is difficult, however, to ascertain in precise practical terms in just what this progress consists, in view of the widely varying types of procedures which have been projected for several of the larger English cities.

In this connection it is of interest to note the position of the local government board. As many of you know, plans for sewage disposal are normally presented in England to this board for approval, in order to secure authority for the loans needed to cover the cost of construction of new works. While this board has approved a number of plans embodying new types of purification processes, it has in every instance, so far as we know, insisted that the loan be increased to cover cost of land treatment, to follow, if needed, treatment by the new process. In the opinion of a majority of English sanitarians these qualifications are needlessly burdensome. Notwithstanding, very recent developments indicate that the board will hold its position until it receives for its guidance the report of the royal commission appointed last year to investigate the new processes.

It is to be added that it is possible to circumvent the direct approval of the local government board by means of a special act of Parliament, although the board still exerts its influence through committees. This procedure is expensive, and it is prohibitive for this reason for the smaller cities. A number of the larger cities, however, are availing themselves of this step.

Summing up in brief terms the present English evidence upon new processes for sewage disposal, it may be said that while it shows many promising features, it is not yet sufficiently definite and exhaustive to allow final conclusions to be drawn.

DISCUSSION BY F. A. W. DAVIS, INDIANAPOLIS.

The committee defines what constitutes a satisfactory water supply in the light of our present knowledge, as follows, beginning with this statement:

"The modern water supply must provide, under adequate pressure, a sufficient quantity to meet liberally all legitimate use and unavoidable waste of water, which is either originally pure and wholesome, or which has been rendered so by some process of purification. With regard to quality, the water supply of the future should meet the following requirements:

"(a) It shall be free, or substantially free, from disease-producing germs.

"(b) It shall be clear and colorless, or

nearly so, containing no objectionable turbidity or vegetable stain.

"(c) It shall be free from objectionable tastes and odors as supplied to the consumer.

"(d) It shall be free from noticeable amounts of dissolved iron such as unfit it for household use.

"(e) It shall be free from excessive amounts of lime and magnesia such as make a water too hard for ordinary use.

"(f) It shall be carefully examined with regard to constituents capable of dissolving metals used in distributing pipes, and this information in connection with the pipes employed should result in such steps as necessary being taken to guard against complications of this nature."

The requirements mentioned are reasonable and are attainable, as the committee suggests, "at a cost dependent upon local conditions." It points out that the cost can, to a certain degree, be offset by restricting the waste. This is a difficult proposition, because of the general belief that water should be free as air. Meters have been suggested. While there is no question of the equity of the proposition, yet the people as a general thing do not approve of a meter system. Preliminary to the attainment of the requirements of the committee, it is essential that the water that is to be provided for the use of the citizens should be kept as far as possible free from pollution.

The committee rightfully devotes much of the report to sewage pollution, and it is well that it does, as it is certainly in line with the aims of the Health Association. It does not seem reasonable for a city or manufacturer to pollute the entire stream for the sake of getting rid of their refuse. In doing so, they invade the riparian rights of owners of land bordering on streams.

It is just as incumbent upon the city and manufacturer to take care of their refuse as it is for the water department to furnish a potable water. It is essential to the furnishing of potable water that stream pollution should be prohibited, not only by state legislation, but by the general government, for many of the streams flow through different states.

The committee says, "at the present time there is a considerable portion of the inhabitants of the various centers of population which recognize clearly that they are entitled to a water supply which shall not transmit to them water-borne diseases."

Water purveyors agree with the committee, but, they believe, however, that an ounce of prevention is worth a pound of cure and that it is expecting too much of the water purveyors to furnish an ideal water when the city and manufacturers throw into the streams from which the supply is obtained, germs of death-producing diseases.

The committee, in giving prominence to sewage purification, as well as the purification of water supplies, has acted wisely.

The report of the committee is valuable to every water department, inasmuch as it gives to them a basis to work from which must result in much good. Recognizing the vast importance of pure streams to inhabitants of this state, the supreme court, in a recent decision, finds the following to be the law and upholds it:

"1. A manufacturing concern located on the banks of the stream which it fouls and pollutes by discharging refuse therein, so as to deprive lower riparian owners of the use thereof, may be enjoined from continuing the pollution, and such riparian owners may recover damages for the injury.

"2. The fact that the concern has expended a large sum of money in the construction of its plant, and that it conducts its business in a careful manner and without malice, makes no difference in its rights to the stream.

"3. Before locating the plant, the owners were bound to know the rights of riparian proprietors, and to determine a location at their own peril, considering the capacity of the streams, etc.

"4. The fact that a water course is already contaminated does not entitle others to add thereto, nor preclude persons through whose land the water flows from obtaining relief by injunction against its further pollution.

"5. Where the complainant, without notice or knowledge of the proposed corruption of the water invited the erection of the plant at the place where it is located, he is not estopped from asserting a claim for damages and injunction."

If the law thus protects an individual in his broad acres, how much more important is it that it should protect streams from pollution from whence water is drawn for the use of the inhabitants of the state.

The committee calls attention to the advancement in methods of purification of water but it does not, in my judgment, emphasize the importance of keeping the streams from which the supply must be taken, from being polluted. Often the pol-

lution is so gross that the streams are an offense to the sight and smell. Anyone can readily realize the impossibility of making an ideal water out of such a supply.

The report of the committee, as a whole, contains much valuable information upon vital subjects, and is well worth thoughtful consideration.

A METHOD FOR THE PRESERVATION OF TIMBER.*

By F. A. Kummer, Jun. Mem. Am. Soc. C. E.

There are two causes for the decay of timber. (1) Through the fermentation of its contained sap, such fermentation being caused by the germs contained or developed in the sap. (2) Through the introduction of germs of decay from without, through the action of air or water.

To treat a tie satisfactorily, it must first be sterilized throughout; removing at the same time as much of the contained moisture as is possible without injury to the fiber of the wood. Fermentation can not then take place from within. It must then be treated in such a manner that germs of decay can not enter from without, or, if they do enter, that the conditions for their development are highly unfavorable. It must further be provided that the antiseptic injected will not be dissipated through any agency, and, if the timber is to be subjected to the crushing effect of heavy railroad traffic, it must in some way be provided that the timber so protected will be able to resist the weights which will pass over it, without excessive crushing.

If a tie be subjected throughout to a sterilizing temperature of 212° F., the agencies of fermentation or decay existing in the sap will be killed, and, if prevented from again entering the timber from without, decay can not take place. This leads to the first important conclusion; namely, that complete sterilization throughout is a necessity in the treatment of timber. Without such sterilization no form of treatment can be satisfactory unless the timber be completely impregnated throughout its entire mass with an antiseptic material, which is rarely if ever accomplished with large timber. Such sterilization means fully 212° F. at the heart of the stick. Wood is a poor conductor of heat, and, to secure 212° F. or more at the heart, two ways are open: (1) long exposure to a temperature of say 215 to 225° F., which is expensive because of the time consumed; (2) exposure to a temperature of 290 to 300° F., which, under ordinary conditions, will injure the fiber of the wood, or at least induce extensive splitting or cracking. The necessity for sterilizing is not brought out in the creosoting process, and it seems to be a point, the vital nature of which is not generally recognized. Experiments made upon yellow pine ties, 6 ins. × 8 ins. × 8½ ft., having self-registering thermometers imbedded at the heart by means of an auger hole, 24 ins. deep, bored from the end, showed, with a temperature of 230° F. in the cylinder and at the surface of the tie, 178° F. was secured at the center in two hours, while with 290° F. at the outside, 249° F. was secured in two hours. Starting with sterilization as an absolute necessity, it is evident that, if such a temperature as 290° F. can be used without injury to the timber, complete sterilization will be effected, and in a reasonably short time. It would be well to state here that, with a few exceptions, the experiments were made on longleaf yellow pine of the best merchantable grade, the exceptions being several experiments upon white oak timber, which showed that it is not capable of treatment by such a process, owing to its great tendency to split and crack under high temperatures.

The method adopted to render the use of such high temperature possible in the treatment of yellow pine is the application of pressure simultaneously with the application of heat. When the doors are closed the heat is raised to 215° F., without pressure, taking one hour to accomplish this, and kept for one hour at 215° F. without pressure. This is for the purpose of getting rid of the moisture. Then the heat is increased, pressure is applied, and both are raised gradually, to avoid injury to the fiber, for two hours, until the heat has reached about 285° F. and the pressure about 90 lbs., and both are held there for one hour. The heat is then shut off, and the tanks are allowed to cool gradually for one hour. At the end of this time the heat is reduced to 250° F., and the pressure to about 40 lbs. The pressure is then blown off, and the heat still further reduced. Vacuum is then applied until about 26 ins. is reached, and while under vacuum the mixture is run into the cylinder at a temperature of 175 to 200° F. and hydraulic pressure applied reaching

*Abstract of a paper before the American Society of Civil Engineers.

200 lbs. per sq. in., and kept at this point until the desired amount of the mixture is absorbed. The liquid is then run off, and the wood is placed in another cylinder and milk of lime, at a temperature of about 150° F., is run in, and hydraulic pressure of about 200 lbs. is applied for from one-half to one hour. The following is a condensed table of the treatment: One hour to reach 215° F.: 1 hour under 215° F.; 2 hours (heat and pressure applied gradually) to reach 285° F.; 1 hour (90 lbs. pressure) at 285° F.: 1 hour cooling; 1 hour vacuum (26 ins.); ½ hour filling cylinders with mixture; 3 hours pressure (average 8 to 10 lbs. absorption); ½ hour emptying tanks, and 1 hour under lime and pressure treatment.

The time will be increased or decreased, in keeping with the amount of absorption required.

The treatment of "green" lumber herein mentioned consists of simply putting the lumber in the cylinders and raising the heat to about the temperature of the liquid—say 200° F.—and then running the liquid in and keeping it there from three to four hours. Of course, this does not sterilize it or give as good absorption.

After the preliminary treatment, the temperature of the interior of the cylinder is raised to 285 or 290° F. If this temperature were maintained at atmospheric pressure, not only would the sudden and rapid evaporation of the remaining moisture in the stick induce splitting and cracking, but the volatile oils in the wood would be driven off, and this is not desirable, inasmuch as they play a not unimportant part in the preservation of the timber. Air pressure is therefore maintained in the closed cylinder at about 80 to 90 pounds per square inch, so that while the tie is sterilized by heat, the natural oils are not driven off, and splitting and cracking does not result, while the heat is at the maximum.

One of the benefits of the vacuum is to exhaust the air which has been forced in while the wood was under pressure, and which, if not removed, would have to find its way out subsequently either through the mixture or by creating cracks.

The preservative fluid used is not creosote, or dead oil of tar alone, but consists of dead oil of coal-tar, 38%; formaldehyde, 2%; and melted resin, 60%, by weight. The specific gravity of the resulting mixture at 300° F. is 1.068. The resin is used to render the mixture absolutely waterproof, the formaldehyde to strengthen the antiseptic nature of the compound, necessarily somewhat reduced by the reduction in percentage of the dead oil itself.

This mixture is perfectly fluid at 300° F., and, by some peculiar action not readily explainable, seems to be more readily forced into the wood than the creosote oil alone. There are a number of very important advantages gained by the use of the resin in connection with the dead oil. Timber treated by the ordinary creosoting process is more or less spongy and soft, and while the dead oil is not generally regarded as soluble, it is still subject to dissipation by the action of water, as is well known in the case of treated piles subject to the washing action of salt water. Experiments made by immersing in water timber untreated and treated by the process just described, showed results as follows:

One piece creo-resin timber, 6 ins. × 8 ins. × 8 ft., immersed in water 27 days, absorption 1¾ lbs. One piece, same stick as above, untreated, absorption 11¼ lbs. The increase in weight of the first stick was largely due to water clinging to the surface.

Timber treated with dead oil in conjunction with resin is practically absolutely waterproof and very much harder than the untreated timber, instead of being softer and more spongy, as is the case with creosoting proper. The introduction of bacteria from without should be prevented by a process as highly waterproof as it is possible to make it, and this process should use a material which will not only have these waterproof qualities, but will be so antiseptic in nature that the possibility of the existence or development of decay germs, if such germs by any means gain an entrance into the timber, should be reduced to a minimum. In fact, the conditions should be such as to absolutely preclude any possibility of their life or development. To secure these results, the combination of resin, creosote oil and formaldehyde is especially well adapted. The material weighs about 8.9 lbs. per gallon.

A tie treated by the above process, with say, 10 lbs. of preservative per cu. ft., possesses these advantages: It is thoroughly sterilized—a result not generally secured by the creosoting process — the outer fibers of the wood are filled with a material more highly antiseptic than dead oil of coal-tar, practically waterproof, and, when hard, considerably better able to resist crushing or cutting than is either the untreated or the creosoted timber. In fact, the spongy nature of creosoted timber, especially as the

timber usually chosen for creosoting is naturally soft, has been one reason why creosoted timber has not been more extensively used under heavy traffic. The experience of the Lehigh Valley R. R. was along this line. A tie treated by the process in question also possesses much higher spike-holding qualities—considerably higher that the untreated stick.

The writer has confined these remarks particularly to the subject of railway ties; but it is readily practicable to creosote piles, giving them either at the same time, or subsequently, a resin treatment to absolutely retain the creosote in the wood, and therefore the chief objection to creosoted piling would be at once removed.

The question of wooden paving block is also one having, in the writer's opinion, great possibilities. Wooden paving blocks, creosoted, are in extensive use in London and continental cities, and have given very favorable results in this country wherever properly used. If we add to the preservative effect obtained by the creosote oil the additional and most important benefit of so hardening the fibers of the wood that its resistance to wear is materially increased, we have realized a most material gain in the treatment of such blocks. In fact, if a treated pine paving block, protected against decay by dead oil of coal-tar, impervious to moisture and having considerably greater density and resistance to abrasion than either the creosoted or untreated timber, can be laid at a cost not greater than that at present charged for asphalt, it is the writer's opinion that such a pavement will possess all the advantages which asphalt possesses, and will be at the same time both noiseless and not slippery. The writer thinks that such a pavement would have a longer serviceable life than asphalt—at least such as is generally laid—and on streets of a certain class be exceedingly desirable.

THE QUESTION DEPARTMENT.

[By Charles Carroll Brown, M. Am. Soc. C. E., for MUNICIPAL ENGINEERING.]

ELECTRIC LIGHT PLANTS FOR SMALL CITIES.

I wish to arrive at approximate cost of an electric light plant of sufficient size to supply the ordinary requirements of Bessemer, a town of 10,000 inhabitants. What horse power would probably be required and where could I get statistics on the cost of running such a plant? Can you refer me to a town of some size where I could get a report on the workings of its plant?

I read your magazine with great interest. Any information will be appreciated. Yours truly,

Thos. T. Huey,
Mayor of Bessemer, Ala.

There are so many variable quantities in an electric light plant which depend upon local conditions, that this question can not be answered with any definiteness except by an engineer after a study of the local conditions. The reports of the electric light committee of the American Society of Municipal Improvements, especially those printed in the 3d, 4th and 5th annual reports of conventions give considerable information which will be of value, although the variations in figures show the effect of local conditions to be great. D. L. Fulton, secretary, Allegheny, Pa., can furnish these reports. Among the cities mentioned in these reports which operate their own plants are the following, of about the size of Bessemer. The superintendents of these plants will no doubt be willing to furnish desired information. Champaign, Ill., 72 lights on moonlight schedule, cost $64.30 a year each. LaSalle, Ill., 98 lights on moonlight schedule cost $46.00 a year each and the plant cost $12,400. Dunkirk, N. Y., 75 lights on moonlight schedule cost $45.50 a year each and the plant cost $21,000. Fort Worth, Tex., 68 lamps on moonlight schedule cost $64.48 a year each and the plant cost $44,000 with provision for 400 32-candle-power incandescent lamps in addition to the arc lamps. Crawfordsville, Ind., has a municipal plant which is said to be well constructed and managed.

BOOKS ON GRAVITY WATER SUPPLY.

Will you kindly inform me as to the titles and publishers of the best works on gravity water supply? *C. L. DeMott.*

Fanning's "Practical Treatise on Hydraulics and Water Supply" ($5) is probably the best book on the general subject named. Folwell's "Water Supply Engineering" ($4) is also good. Wegman's book on "Dams" is valuable in its line. Municipal Engineering Company can furnish any of these books at the prices given.

LOCATION OF ESTABLISHED GRADE POINTS.

Where, in your opinion is the *proper* place to establish grade points for street and avenue intersections?

In our city grades are established at a point opposite the center line of the street or avenue with curb grade 0.2 higher than center grade and a slope of ¼ inch per foot for sidewalks from curb to property line. Since the establishment of grades, changes have been made in the width of roadways, the width of roadways being reduced, thus increasing the distance from curb to building or lot line with the corresponding increase in elevation.

Will you kindly advise me through the magazine?

Subscriber.

A detailed answer to a similar question will be found on page 167, March, 1900. So far as the street grades are concerned, it is probably best to break the grade on streets with good slopes at the property lines, making the grade across the intersection of two streets level, or at least with less slope than the rest of the street. When the streets are nearly level it makes little difference. So far as sidewalks are concerned, the narrowing of the street will affect their slopes. It is usually possible to change the curb grade so as to allow the necessary slope in the walk when the curb is moved. Such slight changes are not noticeable, and the curb grade need not be exactly parallel with that of the center of the street. If cement or smooth stone walks are used, a reduction of the transverse slope of the sidewalk below the rate mentioned will be an improvement. A careful workman can so conceal apparently large departures from the standard regulation that they will not be visible except when tested with an instrument.

GARBAGE DISPOSAL IN SMALL CITIES.

Our city is becoming interested somewhat in the subject of disposal of garbage in a small way. Can you refer us to any books, or persons who have had special experience in the disposal of garbage for small cities?

Our village is about 7,000, and the subject of course presents some very perplexing points on account of the limited amount available for such service, and also the small amount of material to be handled in that manner.

M. W. Mix.

The unique method in use at Moline, Ill., is described on p. 160, March, 1900. That the method of cleaning the garbage is effective is evidenced by an editorial note on p. 179. Perhaps the best information on the subject in general, is contained in the annual proceedings of the American Public Health Association from year to year, see especially 1897. Other articles on garbage disposal but mainly in reference to larger cities are on pp. 99 and 303 of Vol. xvii., pp. 31, 115 (a plan for a small city), 119, Vol. xvi. On p. 386, of the same volume (June, 1899) will be found a list of the articles appearing in MUNICIPAL ENGINEERING on the subject prior to that date. There are no books giving any adequate treatment of the subject, none which consider the conditions of the smaller cities. See also the description of the Fort Wayne method in this number.

DISTILLATION vs. PUMPING.

I had sufficient interest in the question of "J. L. S. Mexico," on page 271, October number, in regard to Pumping vs. Distilling to make some calculations on it, and reached the following result:

"J. L. S." gives the quantity "from 500,000 to 1,000,000 gallons" (presumably per 24 hours). Assuming 648,000 gallons per day it will be just one cubic foot per second. Supposing the pump to make 60 strokes per minute, and the length to be 24 inches, the diameter for a capacity of one cubic foot will be 9⅛ inches. The length of the pipe being 63,600 feet, if the diameter is 8 inches the friction head will be 318 feet, which added to the elevation, will make 1,118 feet total head to pump against. This will be 485 pounds per square inch, a total pressure against the pump piston of 34,435 pounds. Assuming the effective steam pressure to be 150 pounds per square inch (making no allowance for friction of machinery), there would be required a steam cylinder 17½ inches in diameter. The stroke being two feet the capacity of the cylinder would be 3.27 cubic feet, which would be the quantity of steam required per second. Without allowing for expansion, but adding atmospheric pressure, the boiler pressure would be 165 pounds.

At this pressure, the relative volume of steam and water being 188 to 1, the quantity of water consumed would be .017 cubic feet per second or just one cubic foot per minute. So that to pump the quantity required, would require the evaporation of one cubic foot of water per minute at 370 degrees, and to distill it would require the evaporation of 60 cubic feet per minute at 212 degrees.

Of course a larger pipe would reduce the friction head, but how far it would pay to reduce the fuel bills at the expense of cost of construction is a matter for consideration.

N. S. Frost,
City Engineer, Petaluma, Cal.

The high pressure under which the water is pumped would make extra heavy construction necessary, and would also subject the pumps and mains to greater danger from accidents. The interest on the cost of this heavy main and the probable large expenditure for maintenance and repairs must be added to the computed cost of the steam used to make a closer approximation to the relative cost of the two methods of furnishing water. Any difference in cost of the plants for pumping and for distilling must also be allowed for. Evidently the cost of coal and of materials generally, and of the kind of labor necessary, are essential factors in a comparison of relative cost.

COMMENT ON CURRENT TOPICS.

A German Slag Cement. A new process for making cement with blast furnace slag as an ingredient has been tested in Germany and is reported to produce a good Portland cement, testing for tensile strength 282 to 370 pounds per square inch at 28 days, and 538 to 700 pounds at 360 days. Very careful selection of ore and fluxes is not required at the blast furnace producing the slag as it is subjected to a treatment which removes the objectionable ingredients and at the same time granulates it. The program includes pulverizing the slag and limestone to mix with it, the formation of bricks which are calcined and ground in the same manner as in the regular Portland cement processes. The product is considered to be really a Portland cement rather than a so-called slag cement.

The processes through which the material passes indicate that the cost of the treatment is equal to that of the ordinary Portland cement and any advantage which the process may have in regard to cost must be largely in the cost of the raw materials.

Progress in Methods of Garbage Disposal. The committee on Disposition of Garbage and Street Cleaning of the American Society of Municipal Improvements, presents the following list of questions for discussion, asking contributions to the literature upon these subjects from those whose experience gives them data upon which to base articles descriptive of methods and processes. Such a discussion as the committee desires will certainly add much to the meager stock of knowledge upon these important subjects.

Disposition of Garbage.—1. What conditions should prevail in a municipality, as, for example, the number of population, which would warrant the erection of a reducing plant in preference to cremation?

2. In view of the difficulty that is experienced in getting householders to keep the garbage and ashes separate, is it advisable that receptacles of an approved type be issued by the authorities, and the use of same made compulsory?

3. What pattern of crematory is considered best?

4. Does the burying of noxious substances create unsanitary conditions? If so, for what period of time do these conditions prevail after dumping has ceased?

5. Can the collecting and disposing of waste substances be done by day labor as economically as by contract?

Street Cleaning—6. What is the best method of cleaning asphalt pavements in order to obviate the dust nuisance of which merchants complain so much?

7. What are the merits of the machine which is used in connection with what is known as the suction process for cleaning asphalt?

8. Does continuous watering of asphalt as a means of allaying the dust injure asphalt?

9. Is anything known of the process of allaying dust on roads by sprinkling oil thereon?

The paper by Mayor Scherer of Fort Wayne, in another column discusses one or two of the questions in a practical manner and will be of much value to cities who are in the midst of difficulties and finding no easy remedy. The records of cost of and the descriptions of methods of collection and treatment of garbage are full enough to satisfy any inquirer who has not yet begun the actual design of a plant for his local conditions, and will be a valuable guide to him when he has reached this stage.

Value of Full Statistics of Water Plants. The paper by Mr. Baker on another page emphasizes the fact that very few reports of the operation of water-works are of any value to those who make them or to those who read them. This is true of reports of municipal operation because the average superintendent of smaller works in particular is not an expert accountant in any sense of the term, and is seldom able to get the facts of the operation of his plant together and make investigations and comparisons to determine the economy of his methods. If there are no leaks and the pumps work smoothly, and he is able to keep up the pressure called for, he is satisfied that the work is going on properly and that nothing further is necessary. The report of receipts and expenditures may be given to the smallest detail of items and persons, but no indication of the application of the payment to the detail of construction, repair or operation seems to be called for, and usually the information necessary to make a close study of these branches of the operation of the works is entirely wanting or is to be obtained solely by accident. The consequence is that often needed repairs and changes in apparatus and methods are not made until the condition of the works becomes such that they can not continue in operation without large expenditures for reconstruction. This work costs much more than if its need were discovered and it were done when the need actually arose.

The same trouble occurs in works under

private operation, and many failures of such companies to operate successfully are due to these failures to keep proper check upon the methods in use, on account of lack of proper knowledge of the details of operation. There are fewer such instances, however, among private owners, as the responsible financial control is more closely interested on account of the expected profits of operation, and therefore, require reports made in sufficient detail to make a close study of the results possible, and to give a basis for modifications of methods to increase the economy.

The value of the various forms offered by the societies of engineers and others lies largely in the fact that they presuppose methods of bookkeeping which will make such reports possible, and that when such methods must be introduced to make it possible to fill out the forms of report, the necessary data for a full study of the economy of operation are on record and can be used by any one interested in determining the condition of the works.

The forms are of value for this purpose in direct proportion to their fullness and applicability to this purpose. Some of the forms proposed are hardly sufficient for this purpose, though a fair general idea of the conditions under which the plant is operated and its adaptability to these conditions can be gained.

When bookkeeping forms are adopted for use in the actual daily operations, like those prepared by the publishers of this magazine, a still further step in the direction of full knowledge of the operations of the plant is taken, with greater ease and with more certainty of correctness of form, in the absence of expert accountants in the management of the works.

It is hoped that the movement to secure co-operation of the numerous societies interested in municipal problems will lead to a single recommendation of a form of report which will pay proper attention to the important phase of the question here presented.

Moisture in Sand and Mortar Proportions.

An experienced experimenter in the line of testing cement, in commenting on the discussion of the manipulation of materials in making tests, on page 30 of our July number, says that two per cent. of water added to dry sand may make twenty per cent. change in volume, when measured loose. Have any of our readers any further information upon this point, derived from actual tests? Such a result as this demonstrates the necessity of using dry sand for mixing with cement to make briquettes for tests. If moist sand is weighed, the percentage of cement is increased an indefinite amount, owing to the uncertainty regarding the amount of water contained, and if it is measured, even with care, the increase in percentage of cement and also in uncertainty is still greater. Sand for tests must therefore be dry. The results of tests, if damp sand is used, would usually be higher than with dry sand on account of the increased proportions of cement.

For use in practice, the amount of cement for a given mixture can be determined exactly by weight, but there is always some indefiniteness about the determination by measure, though this is reduced to a minimum if the measurement is made in the original package before the cement is loosened up by the process of removal from the bag or barrel. The amount of damp sand will be indefinite by weight because the amount of water in it is unknown. It will be still more indefinite if measured loose, as the experiment reported shows. The increase in volume will be greater than the increase in weight, so that the percentage of cement in the mortar will be greater if the proportions of cement are determined by measurement than if they are determined by weight. Under the usual specifications a stronger mortar will therefore be obtained when damp sand is used, on account of this increase in proportion of cement, and if the materials are measured this increase will probably be appreciably greater than if they are weighed. Under ordinary conditions of measurement and inspection, therefore, it will be better for the work to have the proportions of materials determined by measurement rather than by weight. With dry materials, under the careful manipulation of the testing laboratory, there is a little closer approach to accuracy of proportions if the materials are weighed.

The Value of the Septic Tank.

The visit of the American Society of Civil Engineers to Europe last summer enabled a number of the members of that society and others attracted by it to visit the various systems of sewage disposal now under experiment in England.

Among the valuable papers on sewage disposal resulting is one by Professor S. P. Kinnicutt, of Worcester Polytechnic Institute before the last convention of the New England Water-Works Association. After a consideration of the various systems of sewage purification which have prevailed in the past, he describes in detail the work of

the systems in use at Dibdin, Thudicum, Barking and Sutton, including septic tanks and contact beds.

He finds the difficulty in the contact beds, whether double or triple, to be in the clogging of the beds by the solids deposited. The remedy he finds in using the septic tank as a preliminary treatment, from one-half to two-thirds of the matters in suspension disappearing in the tank and the remainder being taken care of without trouble by contact or filter beds, preferably the latter.

In the septic tank the action of the bacteria and of the substances formed is to disintegrate and finally dissolve the cellulose in paper, wood fiber and starchy substances, to break up nitrogenous compounds into simpler substances. In the process much carbonic acid, ammonia, marsh gas, hydrogen and nitrogen are given off, part of which are absorbed by the water and part escape as a combustible gas. The ammonia being absorbed increases the amount of free ammonia in the effluent, while the albuminoid ammonia and the oxygen consumed are decreased. It is shown that the closing of the tanks or even their protection from the light is not absolutely necessary, the effluent from both classes of tanks being practically the same. It has been thought that full septic action in the tanks could not be attained for some weeks after they were put in action, but Professor Kinnicutt reports that a new tank can be started in two or three days if some of the scum from the top of an old tank is added to the new one.

After the septic tank an additional purification is usually required. The works at Horfield, it is claimed, can purify 8,000,000 gallons of septic tank effluent per acre per day by the process of continuous filtration, the liquid being dripped upon a bed of cinders for the purpose of aerating it and keeping the bed aerated.

A note of warning regarding the septic tanks was sounded by Mr. R. Hering in his discussion of the paper and also in his discussion of the able report by the committee, of which Geo. W. Fuller is chairman, made to the American Public Health Association in Indianapolis, October 23-26. He finds that the glowing pictures of the success of the new English processes are not justified by the facts. He thinks that the best is not yet found, and that all we can say is that the results are better than by the older processes. Intermittent filtration is for him the only treatment necessary, and the best for American conditions. He, as well as Mr. John W. Hill, think now that our American rivers, under our conditions of climate, rainfall, amount and character of flow, and relative amount of sewage discharge, can stand any amount of pollution that does not produce an actual nuisance at and below the point of discharge. The filtration of water, he thinks, will become more general, and with the natural purification in the stream will obviate the necessity of special treatment of the sewage.

It is quite possible that some of the advocates of the septic tank will injure its popularity by making too sweeping claims for it, and expecting it to do more than it is capable of doing, but even then it is not probable that so cheap and relatively efficient a method will be abandoned without putting something in its place. There are still too many adherents to the doctrine that the streams should be kept as clean as possible, especially when used as sources of water supply, to submit quietly to their use as sewer outlets and place the entire burden of purification upon those proposing to use the water for domestic purposes. We can not all agree with Mr. Hill that a few disease germs can be tolerated in the water, so long as there is the least possibility of keeping them out or at least of removing them.

A Peculiar Case of Stream Pollution.

A peculiar phase of stream pollution is reported from Deadwood, S. D. The city of Lead is constructing a sewer system, and proposes to discharge the sewage, without purification, into a small stream which passes through Deadwood, about three miles below. The dilution, under the original condition of the stream, would be insufficient to prevent nuisance, and this would also be the case with the present additions made to the stream for milling purposes were it not that about 2,400 tons per day of fine sand, tailings from stamp mills, accompanied this extra supply. This large amount of clean material so dilutes, separates and comminutes the solids in the sewage that no nuisance is possible under ordinary conditions of flow. Another supply of water will soon be added, nearly doubling the flow, but it will be accompanied by the tailings from a large cyanide plant with a capacity of 1,000 tons a day. This chemical pollution, added to the sewage pollution, makes doubtful the purity of a water supply for Deadwood, obtained by going to ground water under the creek.

THE OHIO MUNICIPAL CODE COMMISSION ON THE SUBJECT OF FINANCE AND TAXATION.

By August Hermann, Cincinnati, Ohio.

A year ago at Toronto the writer called attention to the fact that in the state of Ohio a commission had been appointed in 1898 for the purpose of revising the municipal code of that state with a view of securing uniform government throughout its various cities, villages and hamlets.

This commission reported the results of its labors to the governor of the state last fall, since which time the report has been transmitted by him to the general assembly for its consideration. The report covers very nearly 200 pages of closely printed matter and is certainly of great value to all persons interested in municipal government and municipal reform.

The new code has not, as yet, been adopted by the general assembly, but will be taken up and considered at its next session. At the request of several members of the society, I submit for your consideration a resume of the committee's report on the question of "Finance and Taxation," believing it may be of some interest to all of you.

The new code provides that the council of a city or village shall have the power to levy, annually, for the general purposes of the corporation, such amount of taxes, on each dollar of valuation of taxable property in the corporation on the tax list, as may be determined upon by it, not exceeding the fololwing rates:

In a village, one mill; in a city, having a population of two hundred thousand or more inhabitants, five mills; in a city having a population of one hundred thousand inhabitants or more, and having less than two hundred thousand inhabitants, three mills; in a city having less than one hundred thousand inhabitants, two mills. The population mentioned to be ascertained by the last federal census, or by any municipal census taken according to law.

In addition to the taxes specified in the above, the council in each city and village may levy taxes, annually, for any improvement authorized under a certain title of the revised statutes and for the following purposes:

1. For the real estate and right of way for any improvement.

2. For sanitary and street cleaning purposes, and for street improvements and repairs, including the repairs of paved streets.

3. For improving highways leading into the corporation.

4. For wharves and landings on navigable lakes and rivers, and keeping the same in repair.

5. For constructing levees and embankments, and keeping the same in repair.

6. For constructing and maintaining bridges.

7. For improving any water-course passing through the corporation.

8. For the erection and maintenance of infirmaries, and support of the out-door poor.

9. For the erection and maintenance of workhouses.

10. For erecting, enlarging or improving corporation prisons.

11. For the erection of houses of refuge and correction, and for the expense of maintaining and administering the same, above the receipts arising from the labor of persons confined therein, such sum as may be necessary to meet the same.

12. For the erection and repair of market houses, and for lighting, watching and cleaning the same.

13. For erecting, enlarging and improving hospitals, pest houses, morgues and public bath houses.

14. For erecting, enlarging and improving halls and public offices.

15. For the erection of school buildings, and such rate as may be prescribed by law for schools and school house purposes.

16. For the erection of buildings required by the fire department, the construction of reservoirs, the purchase of steam or other fire engines, and other apparatus, and for keeping the same in repair, and for the support of the fire department.

17. For erecting, enlarging and improving water works, and for supplying the corporation with water.

18. For erecting, enlarging and improving gas works, and for lighting the corporation.

19. For grounds for cemeteries and park purposes, inclosing, improving, embellishing, enlarging and keeping the same in repair.

20. For the construction and repair of sewers, drains and ditches; and where the corporation is divided into sewer districts, the levy shall be by such districts.

21. For the payment of the marshal and the police authorized by this title.

22. For the payment of the interest on the public debt of the corporation, and to provide a sinking fund therefor, a sum sufficient to satisfy the interest as it accrues annually, to be applied to no other purpose.

23. For the purpose of keeping up and maintaining a free public library and reading room; but no tax shall be levied for this

purpose unless a suitable lot and building therefor, supplied with library furniture and fixtures, shall first be donated or leased to, or rented or owned by the corporation.

24. For raising or lowering any railroad tracks on the line of, or across, any street or alley, or for raising, lowering, or constructing ways, crossings or viaducts on the line of any streets or alleys above or below any railroad tracks within the corporation.

25. For constructing and maintaining bicycle paths within the corporation.

26. For waterworks, gas plants, electric light plants, telephone plants, street railway, or any of them, owned, operated and controlled by any municipal corporation, when the proceeds derived from the operation of such works, plant or other plants or such street railway are found to be insufficient to pay the expenses of operating and conducting the same, respectively, and the council of such municipal corporation may levy taxes on each dollar valuation of all the taxable property listed for taxation in the corporation, both real and personal, to pay the amount found to be due on the operating expenses thereof after applying thereto the proceeds of such works, or plant or plants and street railways.

The council shall determine the amount to be levied for each of the purposes herein specified, and such part thereof must be placed on the tax list and collected annually, as it shall by ordinance prescribe.

The limitations contained in sec. 2,651 of the Revised Statutes of Ohio shall not be construed to prohibit special assessments for improvements provided for by this title, nor the levy of a tax to raise means for the payment of the principal and interest of the debts of the corporation, nor of any tax authorized by law for special purposes.

The council may anticipate the tax authorized to be levied for sanitary and street cleaning purposes, by temporary loans; but no loan small be made in excess of the gross amount of revenues raised by taxation for expenditures for such purposes during the then current year, except in cases of extraordinary emergency caused by the general prevalence of an epidemic; and money so borrowed, when paid into the treasury, shall be applied first in payment of such loan.

When the bonds of the corporation have been issued in anticipation of a tax provided for as above, the same tax may be levied to raise means for the payment thereof as is authorized for the purpose for which they were issued.

A greater tax than that hereafter specified may be levied for either of the purposes mentioned therein, if the proposition to make such levy shall have been first submitted to a vote of the electors of the corporation under an ordinance prescribing the time, place and manner of voting on the same, and approved by a majority of those voting on the proposition.

When it becomes necessary for cities to provide grounds, and erect thereon a court house, jail or public offices, for the use of the county, or to contribute to either purpose, the council may levy a tax therefor of one mill upon the taxable property of the corporation; but such tax shall not be levied until the same is approved by a majority of the electors of the corporation, in a manner pointed out in the preceding paragraph.

The aggregate of all taxes levied or ordered by any municipal corporation to be put upon the grand duplicate above the tax for county and state purposes, including the tax for school and school house purposes, shall not exceed in any one year, on each dollar of property as valued for taxation on the county tax lists, the following sums:

In cities having a population of over two hundred and fifty thousand inhabitants, sixteen (16) mills.

In cities having a population of less than two hundred and fifty thousand inhabitants, ten (10) mills.

In villages, eight (8) mills.

The councils of the municipalities shall, annually, at the time the rate of the levy is fixed, provide by ordinance for the distribution of the tax among the several departments of the corporation and for its application to the different purposes of the corporation, in such proportion to their needs as the council may deem necessary; and at no time thereafter shall the amount specified as necessary for the purposes named, be changed, and all transfers of funds from one account to another are hereby expressly prohibited.

In each city there shall be a board of tax commissioners to consist of five citizens of such city. No person holding any other city or county office, shall be eligible to serve as a member of such commission, and such appointments shall be so distributed that not more than three members of the whole board shall belong to the same political party, but nothing herein shall prevent the appointment of persons who act independently of political organizations, it being the object and intent of this provision to make and continue said commission as nearly as may be non-partisan in its political character.

No tax shall be levied upon the property of any city, by the council thereof or any other authority therein, until approved by the board of tax commissioners aforesaid.

The members of said board of tax commissioners shall not receive any compensation for their services.

In all cities the director of accounts shall furnish to the council, and to the board of tax commissioners, respectively, on or

before the first Monday in April of each year, the following statements which he shall have printed in such manner as the board of tax commissioners may direct:

1. A statement showing the balance standing to the credit or debit of the several funds on the city balance-sheet at the end of the fiscal year immediately preceding the first day of April.

2. A statement showing the monthly expenditures out of all the funds in the twelve months of the fiscal year immediately preceding said first day of April.

3. A statement showing the annual expenditures from each fund for each year for the five fiscal years preceding said day.

4. A statement showing the monthly average of such expenditure from each of the several funds for the preceding fiscal year, and also the total monthly average from all of them for the five preceding fiscal years.

5. A statement showing the approximate and detailed estimate of the money needed to pay all lawful expenses of the city and its several departments, offices and institutions for each of the twelve months following of the current and succeeding fiscal year, and in calculating the amount of money needed, he shall take in account the money then in the treasury, as well as that collectible in June following, and also the probable proceeds from the tax levy as he shall estimate the same, as hereafter required, and all other sources of revenue to the city. He shall be equally careful to avoid surpluses and deficits, and shall treat as means available for current expenses the June and December collections, as soon as under the laws and usages he has a right to presume them to be in the treasury, without waiting for their subsequent distribution to the respective funds.

6. A statement estimating the total percentage he deems necessary to be levied in that year, so as to provide sufficient means for paying city expenses for the fiscal periods named for statement No. 5, and he shall also report in said statements to what funds and in what proportion said total levy should, in his opinion, be apportioned as special levies. And said board is hereby authorized to call upon any city officer or board for such information as it may deem necessary to the discharge of its duties, and it is hereby made the duty of such officer or board to furnish such information so required.

The several members of said board of tax commissioners and of the council shall examine and revise said statements carefully, and after the council shall have determined the percentage to be levied for the several purposes allowed by law upon the real and personal property in the corporation returned on the grand levy, the same shall be forthwith submitted to said board of tax commissioners, who shall thereupon consider the same, and within ten days after such submission shall return the same to the council with their approval or rejection, in case of rejection, giving their reasons therefor. They may approve or reject any part or parts thereof, and the parts rejected by said board shall not become valid levies. If the board of tax commissioners approve said levies, or if they neglect to return the same with their approval or rejection within ten days, as aforesaid, the same shall be valid and legal.

To enable the director of accounts and the board of tax commissioners to estimate correctly the levies and appropriations, the head of every department or office, the board of education, the authorities of all city institutions, for whose wants provision is to be made, shall report to the director of accounts on or before the first Monday of March in each year the amount of money needed for their respective wants for the ensuing year beginning on the first of April; and when required by the council said estimate shall be given for each month of such year. The director of accounts, as well as the board of tax commissioners and the council, shall revise them, and if deemed proper shall reduce them so as to prevent unnecessary expenditures and bring them within fair limits to other expenditures required by the city.

The council may make, by the first week of each fiscal half year, detailed and specific appropriations for the several objects for which the city has to provide, apportioned to each month, of the moneys known to be in the treasury, or estimated to come into it during the six months next ensuing, including in their estimates the revenue, and be careful to provide in their appropriations for every legitimate city expenditure, and to apportion the means fairly and legally among such expenditures, or the council may make such appropriation separately for each month. All expenditures within the said following six months or said month as the case may be, shall be made in accordance with and within said appropriations. Balances thereof, or credits remaining over at the end of the year, shall then no longer be open for payment therefrom, and shall be recredited to the funds from which they were taken.

The council shall cause to be certified to the auditor of the county, on or before the first Monday in June annually, the percentage levied by it on the real and personal property in the corporation returned on the grand levy, who shall place the same on the tax list for the county in the same manner as township taxes are by law placed thereon; the ordinance prescribing the levy shall specify distinctly each and every purpose for which the levy is made, and the per cent. thereof; and when a corporation has

been formed ,or boundaries of a corporation extended, subsequent to that time, the council shall determine whether it would be right and expedient to assess a tax on the taxable property in such territory for the current year, and if the council determine to make such levy, it shall also determine the rate, and time of payment, and certify the same to the county auditor, which tax shall be placed on the duplicate and collected as other taxes.

The taxes of the corporation shall be collected by the county treasurer, and paid into the treasury of the corporation in the same manner, and under the same laws, rules and regulations as are or may be prescribed for the collection and paying over of state and county taxes; and the corporation treasurer, or other person or officer having charge of the taxes paid over by the county treasurer, shall keep a separate account with each fund for which taxes are assessed, which account shall be at all times open to inspection.

Nothing shall be construed to prevent any corporation that may elect to do so, from levying and collecting taxes, as authorized by this title, within the corporation; and when any corporation elects to levy and collect such taxes, the council shall provide, by ordinance, for the appointment and control of the necessary officers to carry the same into effect; which officers shall have the power, and be under all the restrictions of county auditors, county treasurers and township assessors so far as the same are applicable to them, except in the sale of delinquent lands.

The council may order the clerk, or other proper officer of the council, to certify any delinquent tax assessed by the corporation to the auditor of the county, which delinquent taxes the auditor shall place on the list of the county, in a separate column, and the same shall be collected in a like manner as delinquent state and county taxes.

If any special assessment is made, as authorized by law, and bonds, notes, or certificates of indebtedness of the corporation are issued in anticipation of the collection thereof, the ordinance directing the assessment shall specify the amount according to benefits or by the front foot, to be paid, and where the assessment is payable in installments, the amount to be paid annually; and it shall be the duty of the director of accounts in cities and of the clerk in villages, on or before the second Monday in September, annually to certify such assessments to the council, to be by it confirmed, and thereupon it shall direct the said director of accounts or clerk to certify the same to the county auditor, who shall place the same on the tax list, and the county treasurer shall collect the assessment in the same manner as other taxes are collected, and when collected he shall pay the same to the treasurer of the corporation, to be by him applied to the payment of such bonds, notes or certificates of indebtedness, and interest thereon, and for no other purpose; and for the purpose of enforcing the collection of the assessment, the county treasurer shall have the same power and authority now allowed by law for the collection of state and county taxes.

If a special assessment is made for sewerage purposes as authorized by law, and the bonds of the corporation are issued in anticipation of the collection thereof, such assessment shall be certified to the council, confirmed, certified to the county auditor, and collected at the same time and in the same manner, as provided in the preceding section, and when collected shall be applied to the payment of the bonds, and to no other purpose.

The council may impose taxes and assessments upon parcels of land laid off into lots, and sold or leased by metes and bounds, or other description, though the same may not have been platted and recorded.

The council shall not make any appropriation, nor contract debts or obligations of any description, for either of the purposes specified in the levy of the council, as provided for in section twenty-six hundred and sixty-seven, exceeding the amount of taxes and revenues from other sources, for the current year, received for such purposes; and the money belonging to one fund shall not be transferred to another, nor used for any purpose except that for which it was collected and received.

It will be seen from the foregoing that the commission has given this matter a great deal of thought and attention, and I have no doubt that if this feature of their report is ever enacted into a law in Ohio or elsewhere it will certainly prove satisfactory.

CURRENT INFORMATION.

Twenty-Eighth Convention of American Public Health Association.

The meeting of the Public Health Association at Indianapolis, Oct. 22 to 26, was well attended and the visitors were well entertained by the citizens who had the arrangements for the convention in charge.

The laboratory section, of which Dr. Theobald Smith of Harvard college medical school was president, held interesting sessions on Monday. The papers were highly technical in their character and many of them presented various studies of the bacterium coli communis, which is generally accepted as an index of sewage pollution in water or of pollution from animal sources.

Among the papers and discussions presented at the general sessions of interest to engineers was the report of the committee on pollution of public water supplies, George W. Fuller, chairman, followed by papers of members of the committee, and formal discussions by Mr. Rudolph Hering, Mr. John W. Hill, Mr. F. A. W. Davis and Mr. H. W. Clark, and by speeches from the floor by several members of the association. This discussion occupied the whole of the engineers' session of the convention and gave it perhaps the most practical tendency of any session held. Mr. Fuller's report was in part a summary of the papers presented by members of the committee and appears in our columns. Mr. Hering said:

"We must consider, in establishing a water supply, proper pressure, proper quantity and proper quality. Regarding the question of quantity, most of you know that we have a bad reputation in Europe, where we are considered as wasting a very large amount of water. Our consumption in our cities is much greater than almost anywhere in Europe. It is hardly understood over there how this can be possible. We here know why this is so. It is not because we actually use very much water that we account for this discrepancy. The chief reason lies in the fact that we are more careless than in Europe. We allow our fixtures to leak, our pipes are not laid as well here as there. Besides, the figures given in reports of water boards do not represent the proper amount of consumption. There is no doubt the waste in consumption may be decreased gradually and brought to something near what it should be. The legitimate consumption here, as in Europe, is constantly increasing. Small manufacturing concerns have increased the consumption of water.

"When it is recommended to purify a water supply, there comes the objection of expense, which attends purification works. its use upon a large scale for city supply. It is said, why not reduce the quantity of waste immediately? You can not suddenly change the habits of a people; you cannot at once pull up the pipes in a city and make repairs. In the meantime you are obliged in this country, from a political standpoint, to estimate the cost of works to purify these large amounts of water. In New York city 115 gallons of water is allowed per day to each head of population. In Philadelphia 150 gallons per day per head is recommended for filtration. Works put in to meet these conditions (the people in the meanwhile being educated against waste), will last a long time before they will need to be increased."

Mr. Hill said that an attempt at the present time to supply a filtered surface water, absolutely free from disease germs and wholly innocuous to health, would be accompanied by a cost which would prohibit its use upon a large scale for city supply Upon the other hand, with a rigid curtailment of the avoidable waste of water in large cities, the cost of constructing and operating works of water purification will come within the reach of any city which really desires to cultivate the public health so far as this may be influenced by the public water supply.

Mr. Davis's paper is presented elsewhere.

Dr. Snow of the Ohio State Board of Health called attention to the frequent difficulty in securing the construction of disposal works for financial reasons. Thus in Ohio the "referendum" can require a vote upon the appropriation of the necessary funds and a two-thirds vote has been necessary to secure the appropriation, so that without an order from court assessing damages, there is no redress for injuries inflicted. A reduction of the affiirmative vote to a bare majority reduces the difficulty somewhat. Similar trouble occurs in other states. In the case of Mansfield a settling tank, acting somewhat as a septic tank and a contact filter, did not prevent a suit for injunction, but the court held that the natural use of the streams as drains authorized a certain amount of pollution, so that a damaging nuisance must be proved in order to warrant an injunction. The people are quite apt to carry this principle too far, but injunctions have been granted when the nuisance has been sufficient to warrant.

A report of the committee on disposal of refuse materials was presented. Mr. Hering described garbage-destroying plants in various cities of the United States and in foreign countries. He said that no perfect process of disposing of garbage and other refuse has yet been devised, although he praised highly the plants in operation in New York and Hamburg, where the reducing method is employed. The paper said that much to commend is found in both the cremating and reducing processes.

Mr. F. H. Newell, hydrographer of the U. S. geological survey, gave some account of the investigations into stream pollution by that organization and requested co-operation of state and municipal officials.

Dr. Benjamin Lee, secretary of the State

Board of Health of Pennsylvania, is the President for the ensuing year. Dr. C. O Probst, secretary of Ohio State Board of Health, is secretary. Professor Wyatt Johnson of Montreal was elected president of the laboratory section.

The next meeting will be held at Buffalo

An Asphalt Bicycle Path.

A municipal asphalt bicycle path is proposed by the Barrow (England) corporation. The surveyor suggests a path 4 ft. in width, on each side of Abbey road, and extending a distance of nearly two miles.

Temporary Injunction Restraining Discharge of Chicago Official.

A temporary injunction was issued by Judge Dunne, at Chicago, Oct. 26, restraining Mayor Harrison, L. E. McGann, commissioner of public works and the members of the civil service commission from remov- J. Dougherty from the office of superintendent of streets. Superintendent Dougherty was ordered discharged by the civil service board on a charge of neglect of duty and incompetency.

Procedure on Gravel Road Petitions.

A decision was rendered Oct. 26, by Judge Monks, reversing the opinion of the trial court in the case of James T. Prudens vs. Board of Commissioners of Jackson County, Ind. The decision was as follows:

(1) Where the required number of petitioners for a gravel road improvement established every fact necessary to entitle them to have the question of the improvement of the roads described in their petition submitted to the voters of the township, it was reversible error for the trial court to refuse to order such an election, although it did at the same time order an election to determine whether an improvement should be made which embraced such roads with others as prayed for in another proceeding, with which the first had been consolidated. (2) The action of the court in refusing to order a vote on the smaller improvement, and ordering a vote on the larger one, was a final judgment against the petitioners for the former, from which an appeal would lie.. (3) The consolidation of the two proceedings did not constitute an amendment of the first petition. (4) The completion of the larger improvement could not affect this appeal, when such fact was only presented to this court by the suggestion of counsel in the briefs.

A French Slag Cement.

The efforts that have been made in Chicogo to introduce a cement, the principal ingredient of which is blast furnace slag, have attracted considerable attention. The idea of utilizing an otherwise useless product and turning it into a marketable article possessing commercial value is itself attractive. but when the article is actually making a place for itself in the industries, it becomes at once an important factor in the cement trade. If slag can be used, why not other similar by-products. The well-known "Lafarge" cement, for example, is produced from a by-product—the sand contained in the lime calcined at the famous lime kilns of that region. In this French works nothing is wasted, and it was this policy that led to the making of this brand of cement.

It will be remembered that limestone, iron ore and coke or coal are charged into the top of a blast furnace; the limestone is first calcined to lime and the coke begins to burn, until by the time the incandescent charge sinks as low as the tuyeres through which the hot air blast passes, the iron begins to reduce and falls in molten drops into the crucible below. As nearly all iron ore contains some alumina, silica or other gangue, this interferes with the reduction of iron from the ore, and lime is added to combine with the silica to form a readily fusible slag; the latter also drips to the bottom of the furnace, and, being lighter than iron, floats on top; slag thus can be and is topped out of the furnace separately from the iron. As many limestones are magnesian they cannot be used, as it would introduce too much magnesia into the cement; the slag must also be free from iron in combination or otherwise, as it is liable to discolor the cement mortar. Thus it is evident that great care must be used in making the slag for cement purposes, both in the selection of stock and the running of the furnace.

One of the latest instances of this utilization of slag that has come to our notice is that of the blast furnaces of Champigneulles, France. At this place the slag has the following composition:

Silica..	33	to 36	per cent.
Lime....	39	to 45	per cent.
Alumina....	15	to 45	per cent.
Iron oxide..	0.5	to 1.5	per cent.
Managnese..	0.1	to 0.5	per cent.

It is run from the furnace into a vessel through which cold water is kept running which causes the slag to become granular. This method was also used at some of our older blast furnaces in this country, as the slag could be sold and handled to better purpose in this shape. After draining and before drying, the required quantity of lime is added in one of the following proportions:

Pure Lime.
Lime—25 to 30 per cent.
Slag—75 to 70 per cent.

Hydraulic Lime.
Lime—35 to 50 per cent.
Slag—65 to 50 per cent.

The slag and lime are mixed into a stiff mortar, sufficient water being added when necessary to attain this result, and after thoroughly incorporating in a mixer, the mass is spread upon a drying floor; in two

or three days it will be dried sufficiently for breaking up into small pieces, after which it is calcined in a shaft kiln or reverberatory furnace at temperature varying from a dull to a bright red heat, according to the rapidity of setting desired.

After coming from the calcining furnace and cooling, the resulting clinker is ground very finely by stones, disintegrators, or similar machines, an operation which is not difficult, as the slag clinker is quite friable. After packing it is ready for market. There is nothing new or mysterious about this method, and when properly conducted so as to secure a good product, the superior power and labor facilities afforded by a large iron works should combine to produce a cheap and good article.

It is claimed that this cement is superior to the Vassey, being equal to it in hardness after setting, having a greater tensile strength and setting much more rapidly; in fact, this Champigneulles cement is noted for its rapidity of setting.

Stamp Mill Tailings as a Stream Purifier.

The city of Deadwood, S. D., became fearful that the new sewer system of Lead City would be a source of danger and began an investigation of the matter. Omitting the question of pollution of the water supply from the report of Charles Carroll Brown, the engineer making the inspection, the peculiar effect of a heavy load of fine sand,- tailings from stamp mills, in preventing nuisance in the stream, is stated as follows:

1. It is my opinion that if anything approaching a flow of 300,000 gallons of sewage from the City of Lead were discharged into Gold run at the point proposed for the outlet, under the original conditions in that stream, a nuisance would be produced which would affect the city of Deadwood injuriously, both by reason of the objectionable odors and by reason of its effect upon the health of the citizens of Deadwood. This statement is not of much value at the present time, but it should be recorded that it may not be lost sight of. The exact amount of dilution of the sewage by the water of the stream is not now determinable, but it is probably not more than one part of sewage to, say, five or six of water. Observation of streams under similar conditions fully warrants the first statement in this paragraph.

2. Were the amount of water increased to the amount now flowing in the creek, the dilution would be largely increased and would in that case be one part of sewage to twenty parts of water. This would materially diminish the effect of the sewage upon the water, and would therefore reduce the causes for complaint from Deadwood.

3. Were the amount of water increased to that proposed with the new supply added, a still further purification will be effected. It is my opinion that the amount of pollution under such conditions would still be appreciable at Deadwood, and possibly sufficient to affect objectionably the health of its inhabitants.

4. If now we add to the water as described in sections 2 and 3 the 2,400 tons of tailings which, it is reported, are now discharged into the stream.. a very material increase in the dilution of the sewage is effected which, under the conditions in the stream at the present time, is of a nature to aid in the separation of the sewage into invisible and inappreciable particles and to cause its decomposition and return to its original elements to be so distributed as to be without effect upon the stream for its present uses or upon the citizens of Deadwood. These various conditions are thus separated and considered individually because, while some are not probable, it is possible that any of them may exist for an appreciable length of time, and the probable conditions under any of the cases should be borne in mind.

5. There is one set of conditions which requires special attention, and concerning which there is not now sufficient information obtainable on which to base an opinion. It is stated that in winter some portions of the stream fill up with frozen sediment and ice in which the floating material of all kinds is caught and in which sewage would likewise be retained. Whether enough would thus be held back and it would become concentrated enough to cause a nuisance during any part of the year is a question which can only be answered after some experience. In general it may be said that some trouble is possible in the spring before the winter's deposits are all removed. How much cannot be predicted.

Electrolysis in Seattle to Be Investigated.

Electrolysis has made its appearance in the water main system at Seattle, Wash. A number of the mains have been found that are eaten full of holes by the action of electric currents. An appropriation of $500 has been suggested for the purpose of engaging expert engineers to make a test of the water mains.

Electric Lighting in Washington.

A report of the operations of the various branches under the control of the electric departments of the District of Columbia, for the fiscal year ending June 30, 1900, was submitted Sept. 26 by Walter C. Allen, electrical engineer. For street lighting by gas single burners were chosen as the most satisfactory. An ornamental lantern of the boulevard globe pattern is used in the service, which has proven very satisfactory. The contractor furnished all the necessary lanterns and equipment except the posts, and lights, extinguishes, repairs, cleans and maintains the lamps for $30 each per annum. The candle power required to be furnished was reduced from twenty to sixteen, but has been raised for the year 1901

to twenty. The service was well maintained, the average illumination being slightly in excess of that required by the contract. Several important extensions to the incandescent electric lighting system were made during the year. The use of ornamental lanterns for street designation purposes on corners lighted by arc lamps has been found to be very satisfactory, and especially so where arc lamps have been placed at corners or small side streets. The lamps and signs are of such size that they can be easily read from a passing car or vehicle. It is hoped that a number of these lamps will be established during the ensuing year, especially around some of the circles where the street intersections are so confusing to strangers. These lanterns have been painted with aluminum paint, greatly improving their appearance and forming a neat background for the red letters in the signs. A two and one-half foot gas burner is used at an annual cost of $12.50.

Mr. Allen says the electric arc lighting during the last year has been the most satisfactory since his connection with the district. The demand for current taxed the plant to its full capacity and extensions to the system were prevented by the attitude of the company operating the plant in the matter of rates. The clause in the appropriation act for this service stated that not more than 25 cts. per lamp per night should be paid, while an amendment was inserted providing that the company should not charge at a rate exceeding $72 per lamp per annum. Of the two rates mentioned in the act, the company claimed the higher one should be paid, but the district took the opposite view and referred the question to their attorney, who decided that the lower rate should be paid. An agreement was finally entered into between the commisisoners and the company whereby the latter were to furnish the necessary service at $72 per lamp per annum until congress should decide which rate should be paid. The commissioners agreed on their part to reserve a sufficient balance on the appropriation to pay for the service at the higher rate. This prevented any extensions to the service, as the appropriation was just sufficient to pay for the existing lamps at the higher rate. Congress adjourned in June without any expression of opinion as to the proper rate. The result of this was that a balance of over $12,000 remained at the close of the year and no extensions, except the addition of four lamps around the new post-office, were made.

Prize Plans for a Reclamation of New Jersey Salt Marshes.

Of the prizes, $500, $300 and $200, subcribed by the board of trade in July, 1899, at Newark, N. J., for the best plans for the reclamation of the marsh meadows in and around that city, two have been awarded. The winner of the third prize could not be made known for the reason that the envelope containing his name could not be properly identified by the number on it. The winner of the third place was No. 13X. There were two envelopes marked 13 only, but none marked 13X.

Cornelius C. Vermeule won the first prize. His plans take into consideration the existence of the present railroad lines and the fact that along the border of the tide marshes there is a serious and increasing unsanitary condition, due to the overflowing of sewage and the accumulation of wastes. Mr. Vermeule's plan includes an elaborate system of diking and draining the meadows, and the establishment of pumping stations which will dispose of the sewage.

The cost of draining the meadows, according to his plan, including the dikes, ditches, bridges, roads and railroads, and pumping plants, is estimated at $300 per acre, and maintenance at $10 per acre per annum. The entire work would involve an expenditure of $1,500,000, and the annual maintenance would be about $40,000. Mr. Vermeule claims for his plan the following:

1. The entire district will be brought into sanitary condition at once at a cost not prohibitive.

2. It will adapt all parts of the meadows for the best commercial manufacturing or residence purposes at once.

3. It will provide a better outfall for storm water from the built-up parts of the Tenth and Twelfth wards than at present.

4. It will connect the Newark bay water front with the city and remove the nuisances and lack of accessibility, which now prevent improvement of the frontage.

5. It is not experimental.

6. And the proposed pumping plant is the only one to give high economy with prompt availability in case of sudden storm.

The second prize was awarded the United Company of New York, and James Owen of Newark, county engineer of Essex county, was the author of the plan. Mr. Owen believes that to drain the meadows for agricultural purposes would seem futile, and the improvement effected in the character of the soil would not reimburse the owners for the outlay. Assuming that the development will be on the lines of municipal extension, the probabilities are that it would be for manufacturing and business, with incidental residential sections. This plan, therefore, proposes wide streets, with elevated railroad tracks, with two canals which will admit large boats. He suggests the abandonment of the old idea of standard blocks of 800x200 feet, and the adoption of the new size of 500x325 feet.

Proposed Track Elevation in Milwaukee.

Track elevation is favored by City Engineer Poetsch of Milwaukee, Wis., for the Northwestern railroad on Commerce-st. The property-owners are demanding track depression, which would cost about $250,000. City Engineer Poetsch says that depression of the tracks would entail an enormous expense, and would disturb the city's sewerage system, while to elevate them would be a safeguard against accidents, would not disturb the sewers, and the expense would be less.

Fitchburg Gas Rates Fixed by Massachusetts State Light Commission.

The Massachusetts board of gas and electric light commissioners gave a hearing recently on the petition of the customers of the Fitchburg gas and electric light company for cheaper rates for Fitchburg. The Fitchburg gas company was organized under a special charter granted in 1852, and began to suply gas in the following year. In 1898 the company was authorized under the general law to engage in the business of supplying electric light and power. It soon after purchased the plant and franchise of the Wachusett electric light company, and has, since that time, been the only company supplying gas or electric light in the city. The company supplies arc lights of nominal 1,200 c. p. for street lighting and for commercial purposes, incandescent lights for interior use, and electric power. The street lights, numbering 265, are run all night throughout the year at $110 per light. The commercial arc lamps are used mostly in mercantile houses, where they are run from some time in the afternoon, dependent upon the season of the year and the weather, until 6 or 6:30 o'clock, and later in the evening one day in the week, at $7 per month. Incandescent lights and energy for power purposes are supplied by meter, the former at 20 cents per kilowatt hour, with a sliding scale of discounts, ranging from 5 to 20 per cent., according to the size of the monthly bills. The net price for gas for lighting is $1.60 per 1,000, with a further discount of $1.40 to customers who have gas ranges installed, and to certain large manufacturing establishments which use it during the day for mechanical purposes.

After the petition was prepared, and on the day it was filed with the board of commissioners, the present price for gas and incandescent electric light went into effect. A reduction of 20 cents per 1,000 was made in the prices of gas, and a change of incandescent electric light prices was effected through the adoption of the sliding scale of discounts. No reductions were made in the arc light prices for commercial or street use.

The board, in considering the petition, made a careful study of the operating expenses, capital and depreciation charges.

Such economy and skill was exhibited in the first as not to leave it open to criticism. Whether the policy heretofore pursued respecting the others should be continued is, however, a serious question.

Prior to the assumption of the electric business, the gas company had been earning and declaring annual dividends of 10 per cent. and this rate has since continued without interruption upon the entire capital invested in the electric plant. Apparently the company has heretofore failed to fully appreciate the effect of this dividend and maintenance charge upon the prices for electric light, which, together constitute the most important factor in the price. The nearly even raito between the electric plant and its capital seems to justify only a moderate dividend upon the latter, and present conditions require less than heretofore for proper maintenance in both the gas and electric departments. A reduction of the general dividend upon the entire capital and of the charges for maintenance will open the way for the further reduction in price recommended by the board.

The board recommends the following:

1. That, from and after the date hereof, the net rate to be charged for gas shall not exceed $1.45 per 1,000 cubic feet.

2. That the price of commercial arc lights of the type now in use and burning substantially as heretofore, shall not exceed $6 per light per month.

3. That the price of street lights of the type now in use, and burning substantially as heretofore, shall not exceed $100 per light per year.

Forrest E. Barker is chairman of the board.

A Voltage of 30,200 Successfully Carried by Underground Cable.

In a series of experiments conducted at St. Paul, Minn., Oct. 14, by Henry Floy of New York City, the feat of carrying 30,200 volts of electricity through an underground cable three miles long was successfully accomplished. The cable consists of three copper conductors, each about the size of an ordinary lead pencil, each being inclosed in a paper tube and the whole incased in a lead sheet and drawn through vitrified clay conduits. The cable is a part of the system by which the St. Paul Gas Light and Power company will utilize the water power at Apple River, Wis. There will be twenty-four miles of wire overhead. As a result of this experiment they will carry an average voltage of 25,000 volts, furnishing horse power for lighting and power purposes. The highest voltage hitherto attained with this class of conductor was about 20,000.

English Definition of Portland Cement.

It has been found, after exhaustive tests, that the addition of Kentish ragstone really acts as a diluent of good Portland ce-

ment, while blast furnace slag as such is a still more objectionable adulterant. The London Chamber of Commerce has suggested, and the rule has been adopted, that engineers, architects and contractors insist upon the following: "That Portland cement be defined as a mixture of two or more suitable materials, intimately and artificially mixed in requisite proportions, and afterward properly calcined and ground, to which nothing has been added during or after calcination, excepting that an addition, not exceeding 2 per cent. of gypsum is permissible for the purpose of regulating the setting."

Steel Specifications for Brooklyn Bridge Sustained by Court.

An opinion was handed down by Judge Gildersleeve of the Supreme Court, Manhattan, Oct. 19, denying the application of Julius Meyers for an injunction restraining the new East River Bridge Commission from awarding the contract for the construction of the approaches to the new bridge. The plaintiff's action was brought on the ground of fraud in the specifications relating to the quality of the steel to be used, and also, because of a provision in relation to the labor law. Judge Gildersleeve reviewed the claims set up by the plaintiff, touching among other things certain qualities which the steel work advertised for the approaches must possess, and which, as alleged, made competition unfair. The bridge engineers denied this, holding that their requirements were planned in the interest of safeguarding the public and securing contracts only with firms capable of doing good work.

Judge Gildersleeve says:

"As to the effect of limiting competition to a small class of bidders, in causing an increase of the cost of the work, which is charged against the defendants, there is no reason to apprehend any such results, for it is amply shown by the affidavits, read on the part of the defendants, that, so far as respects the requirements of 'finished steel,' there are twenty concerns which now do, or easily can, produce that kind of steel. Whether the commissioners have acted wisely, or not, in selecting and insisting upon the use of a certain kind of steel in the construction of the bridge, it is not for the court to sit in judgment upon the exercise by them of that discretion, which is vested in them by the legislature. For aught that appears before me, I must assume that they have acted honestly and wisely. * * *

"At all events, they cannot be said to be so unreasonable or unfair as to constitute an abuse of the discretion, which the legislature has entrusted to the commissioners. So far as the policy of the commissioners may tend to limit competition, it must be remembered that the purpose of the law, in requiring municipal corporations to invite competition for public works, is based on sound economic considerations: it was never intended that municipal commissions should preside irresponsibly over the competition of unqualified bidders, merely for the purpose of furthering the interests of business. The first consideration in a work of this magnitude is safety and permanence, and all conditions and qualifications affecting bidder and contract must tend to secure these."

He declined to pass upon the labor law involved as it is now before the Appellate Division.

Consequence of Careless Use of Fire Hydrants.

The recent report of the water commissioner of New York deplored the damage to hydrants as a result of carelessness by other men than the employes of the fire and water departments. During the last winter, when the hydrants were nominally used only by the firemen and on special emergency permits, 496 were found in three months which were leaking badly through being improperly closed by irresponsible parties who had opened them. In a number of cases the caps were left hanging by their chains, and stones, pieces of pipe, etc., had been thrown in by mischievous parties. The water commissioner thinks there is no question that much of the trouble came from the careless use of the fire plugs by employes of the street cleaning department.

Springfield Experimental Filter.

The plans for the proposed experimental filter plant at Springfield, Mass., provide for two tanks 17 ft. in diameter; two sand filters 17 ft. in diameter; a 20x40-ft. laboratory. The purpose of the laboratory is to determine whether the water of Ludlow pond can be improved sufficiently to become a suitable municipal supply.

Reburning Damaged Portland Cement

In an article in "Indian Engineering" R. W. Egerton described the successful reburning of damaged Portland cement, as follows: The damaged cement was set solid to the center of the barrels in most cases. It was broken into pieces small enough to pass through a 3-inch ring, and placed in one end of a horizontal semi-cylindrical furnace, 15½ feet long and 4 feet wide. A fire of dust coal was kept up at the other end of the furnace. When the cement was clinkered it was cooled and ground in a mortar mill to pass a screen of 600 meshes to the square inch. If used fresh, this cement heated when slaked, but the trouble disappeared after weathering 15 to 20 days. Two more furnaces of this sort were built as soon as the first trials proved successful, and later a kiln like those for burning lime was built. The body was about 3 feet in diameter, inside, at the top, and 8 feet at the bottom, and 8 feet high; the thimble or

lower frustum was 6½ feet deep. The cement reburnt in this way was about one-third as strong as the uninjured material.

Discharge of Water from New Orleans Steam Plants.

In a report to the council Sept. 24th, City Engineer Hardee showed the number of steam plants and the quantity of water daily discharged into the gutters in the city of New Orleans. An examination of the sanitary flushing main in the river front showed it to be in good condition generally. He pointed out that if it were intended that the steam plants should discharge into the flushing main, it would be necessary to maintain a forty-pound pressure of steam; that it seemed unfair to require the steam plants to discharge into the flushing main when they could discharge into the river for nothing but the first cost of laying pipe; to require the steam plants to sustain the expense of pumping to the flushing main would be onerous. He said the city should encourage the erection of factories, but steam plants should not be permitted to perpetuate nuisances, but, in the avoidance, should be permitted to accomplish the result in the manner most economical to themselves.

Meters the Result of Investigation Into Unauthorized Use of Water in Chicago.

The city of Chicago gave notice, Oct. 13, that the water supply in all pipes in the stock yards and packing house district not controlled by water meters placed under the direction of the city of Chicago, would be shut off after Oct. 21. Pipes used solely for fire protection and controlled by valves under seal will not be disturbed.

City Engineer of Halifax Recommends Water Meters.

In a report to the mayor of Halifax, N. S., F. W. W. Doane, city engineer, says that if the waste of water is not restricted, an additional supply must be secured at a cost of not less than $1,000,000. The waste has increased the consumption to such a degree that the present supply is insufficient for the city's requirements. The general introduction of meters is advised by Mr. Doane, who says:

"The last inspection showed hundreds of places in which water was running to waste unnecesarily. Inspection does no good and would require a large staff. As soon as the inspector leaves the premises the water runs as usual. The adoption of meters seems to be the only sure cure for the waste, and if the waste is stopped the supply is ample. A meter placed on a South End wharf registered 1,400,000 gallons the first month and about 12,000 gallons since. At a stable in the center of the city the month's reading was 40,000 gallons, the reading now is 4,000. A wasting water closet in an Inglis-st. house used 1,000 gallons a day when the meter was put on; it now averages six gallons.

"Providence, R. I., a city which requires a large quantity of water for manufacturing purposes and has 80 per cent. of supplies metered, uses fifty-four gallons per head of the population. Fall River, another manufacturing city, with all supplies metered, uses thirty-four gallons. Halifax uses nearly two hundred gallons. If the water running into Halifax were used at the same rate per head as in Fall River the supply from the high service alone would be sufficient for the whole city. In the face of this it seems absurd to talk of an expenditure of $1,000,000 besides the necessity of tearing up the streets to alter the distribution pipes so that more water could be brought in.

"It is claimed that water is free, but it has cost Halifax $1,100,000 to put it into the taps. No man questions the necessity of measuring gas, electric current, etc. No man thinks it a hardship that boards of health prevent any citizen from doing anything to cut off an ample, pure and free supply of fresh air from his neighbor. It is an injustice to a man to take his water supply from him and throw it away. High service householders are daily taking from the pipes water which they do not need and do not pay for, but which belongs to others who do need it and do pay for it, but do not get it. Meters will stop the carelessness of consumers and use of bad and exposed plumbing, which causes the great waste."

Tarred Macadam Pavement at Hamilton.

F. M. Shepard, United States consul at Hamilton, Ont., describes the successful experiment with tar macadam pavement in that city, as follows:

"The possibility of making good roads at reasonable cost has been demonstrated, and tests extending over a number of years on business streets prove that tarred macadam makes not only a smooth and solid roadway, but one that can be kept in perfect repair at nominal expense.

"The first cost in this city, where limestone is abundant and near at hand, is from 70 to 80 cents per square yard, and the engineer estimates the cost of repairing on heavy traffic streets at less than 1 cent per yard per year, while asphalt costs over 3 cents.

"The addition of tar renders the roadway impervious to water, frostproof in winter, and prevents mud and dust in summer. It is easily repaired and does not require scraping, thus avoiding much wearing on the surface.

"One block of tar macadam laid more than a year ago on a business street where there is heavy teaming shows no perceptible wear today. In residential streets these pavements have been in use eight years, without any repairs, and are still in good condition.

"Most of the stone used here is machine crushed, but during the winter season it is broken by hand labor and paid for per

cord, to furnish employment in lieu of alms to the needy.

"Limestone is used because it is abundant, but granite or flin stone would absorb less tar and stand more pressure and wear."

Architectural Prizes Awarded.

Prizes for designs for the Carnegie library, in San Antonio, were awarded as follows:

No. 1—James Wahrenberger, San Antonio, Tex.

No. 2—Riley Gordon company, Dallas, Tex.

No. 3—McAdoo & Phelps, San Antonio, Tex.

No. 4—Riley Gordon company, Dallas, Tex.

No. 5—A. Giles, San Antonio, Tex.

Why Sioux City Must Pay Deficiency in Paving Assessments.

A decision was rendered in the federal court by Judge Shiras, Oct. 20, in the case of Vickery vs. the city of Sioux City, Ia., in which it is inferred that he holds that the city must make up the deficiency when property-owners invalidate the assessment. The plaintiff contended that the bonds are issued against specific pieces of property, but that the custom of the city has been to use all collections of such taxes as a common fund, paying off the bonds in the order they are presented. Thus the money received on account of a valuable piece of business property migh be used to pay an assessment on an outlying lot not worth the amount of the assessment. The owner of the outside lot could plead that his bond had been paid, while the owner of the downtown property would decline to pay again. The plaintiff found himself holding a large amount of securities and sued in equity to hold the city liable. Judge Shiras declines to transfer the case to the law side, but said that Vickery is entitled to hearing in an equitable action.

Indianapolis Hot Water and Lighting Franchise.

A franchise has been granted by the city of Indianapolis to the Home heating and lighting company for the privilege of using the streets and alleys for the purpose of supplying hot water and electric lighting. The franchise is for a period of twenty-five years.

The franchise provides that the board of public works shall select a district in which the company is to establish its first plant. The district must not exceed one mile square, and must contain at least 800 residence buildings. The company must establish additional heating plants, or extend any thereof only on petition of property requiring 50,000 square feet of radiation or more, within a territory of not more than one-half of one mile square. The petitioners must submit contracts to become consumers. The annual rate to be paid for hot water heat is fixed at not more than 17 cents a square foot for radiation, while for incandescent electric lighting the rate must not exceed 10 cents a thousand volts. The company is required to keep the temperature of a home at 70 degrees all the time. This applies only to consumers "whose radiation is sufficient." If the company fails to keep its part of the contract, it shall allow to the consumer a discount justly proportional to the reduction in temperature below the maximum. Provided that there shall be no charge against the consumer in October, November, December, January, February, March and April, when the temperature of the house shall fall below 55 degrees; and provided also that discounts shall not be allowed where the company has not been notified in writing of insufficiency of heat, and has had no opportunity to discover the cause nor to remedy the defect, if due to the company's service. Nor shall this discount be required when the cause is due to defective radiation or violation of the company's rules for receiving and distributing heat, or to defective construction of building, or to any fault of the consumer.

The company agrees to pay to the city 5 per cent. of gross receipts from incandescent electric lighting and hot water heating. The twenty-five years of the franchise begin Sept. 1, 1901.

The plant must be ready for operation by the first of September, 1901.

Minneapolis Joins in Narrowing Pavements on Residence Streets.

A new street plan is proposed in the annual report of City Engineer Sublette of Minneapolis, who advocates 28 to 30 feet roadways for all ordinary street purposes in that city. The difference between this and the present width he would convert into boulevards. This would result in a decreased cost of street sprinkling and road repair, and in a marked change in the appearance of the streets. The interest evinced by some of the property owners in the proposed plan leads City Engineer Sublette to believe a general movement in that direction will be made within the next year.

Technical Meetings.

The fifth annual convention of the International Association of Municipal Electricians was held at Pittsburg, Sept. 25, 26 and 27. Officers for the ensuing year were elected as follows: President, Morris W. Mead, Pittsburg; first vice-president, J. F. Zelleuff, Paterson, N. J.; second vice-president, Benjamin W. McAllister, Broadford, Pa.; third vice-president, R. E. Moan, Memphis, Tenn.; secretary, F. P. Foster, Corning, N. Y.; Treasurer, Adam Bosch.

Newark, N. J.; executive committee, M. J. Donahoe, Niagara Falls; William Brophy, Boston; J. W. Aydon, Wilmington, Del.; T. D. Mason, Brooklyn; F. G. Boyd, Baltimore; M. J. Elliott, Elmira, N. Y.; G. F. McDonald, Ottawa, Canada; M G. Campfield, Grand Rapids, Mich. and F. C. Michaels, Peoria, Ill.

The National League of Independent Associations was organized at Springfield, O., Oct. 10, with the following officers:

President, John L. Zimmerman, Springfield; first vice-president, F. L. Shuey, Dayton; second vice-president, Mrs. Conde Hamlin, St. Paul; recording secretary, E. J. Roetzahn, Dayton; corresponding secretary, D. J. Thomas, Springfield; treasurer, F. C. Bray, Cleveland; organizer, Miss Jessie Good, Springfield. The national headquarters will be held at Springfield.

The tweny-eighth annual convention of the American Gas Light Association was held at Denver, Colo., Oct. 17. Officers for the ensuing year were elected as follows: President, E. C. Pratt, Des Moines, Ia.; first vice-president, William R. Beal, New York; second vice-president, Alton S. Miller, New York; third vice-president, Rollin Norris, Philadelphia; secretary-treasurer, A. E. Forstall, New York; members of the council, Charles F. Pritchard, Lynn, Mass.; James Ferrier, Columbus, O.; George McLean, Dubuque, Ia.; William A. Miller, Cincinnati.

The Kentucky Electric Light Association was formed at Lexington, Ky., Oct. 17. T. D. Murray, Lexington, secretary.

The seventh session of the Municipal league of Indiana was held at Richmond, Oct. 10-12, and was well attended, the folowing members being enrolled: Aurora—Mayor George E. Downey, Treasurer Philip Horr, City Engineer A. T. Gridley, Councilman Charles Martin. Berne—City Marshal G. G. Burry. Bluffton—Mayor James B. Plesinger, Councilman William B. Little. Columbus—Mayor George W. Caldwell, Marshal Christopher Ullmer, Councilmen A. C. Kebble and J. D. Emmons. Columbia City—State Senator F. J. Heller and Sheriff Benjamin F. Hull. Delphi—Marshall A. L. Gurley. Decatur—Mayor A. P. Beatty and M. J. Mylott. Elwood—Mayor F. M. Harbit, Clerk James J. Davis, ex-Clerk L. W. Mellett, Superintendent of Police James Wallace, Superintendent of Fire Department M. M. Lee, City Engineer John Tinan, jr.; City Treasurer Will Z. A. Heup, Councilmen Philip Haines, M. S. Ploughe, F. O. Hudson, H. H. Smith, jr.; J. L. Ringo, City Attorney B. R. Call. Ft. Wayne—Mayor Henry P. Sherer, Clerk H. B. Monagin, Councilman B. Barkwertin, City Engineer F. M. Randall, City Attorney William Shambaugh, Superintendent of Police H. A. Forshine, City Vert. George Brown, Councilman G. R. Hench, Captain of Police. Pennsylvania Co., Henry Stoll. Goshen—Mayor B. F. Deahl. Huntington—Mayor L. T. Dungan and City Engineer Frank Guthrie. Lafayette—City Attorney George P. Haywood, Health Offieer W. T. Tilson. Lawrenceburg—Councilman George W. Kunz. Logansport—Mayor George McKee, Councilmen W. A. Holloway and Fred Davis. Marion—Mayor O. S. Jones, Councilman J. A. Gessning. Portland—Mayor Isaac Limmtre, City Attorney George W. Bergman. Fire Chief B. G. Arthur, Councilmen M. F. Partridge, Peter M. Oniger, J. A. Campbell and C. H. Ayres, Marshal Fremont Cass, Policemen George W. Tilbers, G. D. Alien and Will Stephens. Peru—Councilman J. W. Volpert. Red Key—Charles E. Hawling and B. S. Wilson. Richmond—Clerk George H. Knollenberg, Councilmen C. W. Genn, Joseph Reckers, W. P. O'Neal, D. P. Whelan, A. A. Curme, O. A. Leftwich, F. J. Neff, Market Master E. O Dunham, Superintendent Crematory W A. Dunham, City Engineer H. L. Weber. Rushville—Mayor J. M. Fraze, City Engineer William Dill.

The program included papers upon:

"City Sanitation," by Mayor H. Kerlin, Delphi, and Dr. T. Henry Davis, health officer, Richmond; "Mayors, Their Powers and Duties," by Thomas Meriman, city attorney, Decatur, and Mayor John S. Shannon, Alexandria; "Streets—Life of the Best Material," by Harry L. Webber, city civil engineer, Richmond; "Municipal Ownership," by W. H. Shambaugh, Ft. Wayne, and George P. Haywood, Lafayette; "Garbage," by Mayor H. P. Scherer, Ft. Wayne, and Mayor Charles Elmore, Crawfordsville; "Public Parks," by Mayor T. Taggart, Indianapolis, and Mayor J. E. McHenry, Wabash.

There was also a discussion upon a paper by George A. Harrison, superintendent of police, Lafayette, entitled "How Best to Secure the Co-Operation of the Police of the State of Indiana Without Affecting Local Control or Materially Increasing the Expense," particpated in by Mayor G. E. Downey, Aurora; C. P. Call, city attorney, Elwood, and Mayor B. F. Deahl, Goshen.

L. W. Millett of Elwood was made secretary of the special legislative committee for this year. A number of bills will be introduced in the legislature that are of special interest to cities and towns. Of these bills the co-operative police system of the state, and one in relation to suits filed against municipalities for damages by persons who are injured on defective sidewalks are of peculiar interest. It has been ascertained, through statistics gathered by the league, that where persons have been injured on sidewalks, most suits are filed just within the statutory limit of two years.

By this means, it is claimed, the city is practically defrauded out of a proper defense, it being difficult to procure witnesses after such a lapse of time. The proposed law will make it necessary for persons contemplating suit of this character to file notice of such intention within five days from the date of the alleged injury.

The next meeting of the league will be held in Columbus, Ind., in May, 1901. A. C. Kebble of Columbus was chosen secretary to succeed G. W. Genn, whose term expired with this session. All other officers are elected at the spring convention.

New Publications.

"List of Data Required for the Proper Designing of Railroad Bridges and Trestles," by Waddell and Hedrick, consulting engineers, Kansas City, Mo., is a pamphlet of eight pages, giving a list of about all the general and particular questions likely to arise for answer in connection with the design of a bridge across any kind of stream and the approaches thereto, and the general questions arising in the discussion of a project for an elevated railroad. If all the questions applicable to a given case are answered in the detail desired, the bridge designer can fit his design more closely to the actual conditions, and should, therefore, be able to make the most economical design possible, because avoiding unnecessary work in fitting the bridge to the locality. The expenses of a special trip to the site and of special surveys, largely duplications of surveys already made, are also obviated in most cases. Copies of the pamphlet can be obtained from the authors on application.

WATER SUPPLY ENGINEERING—The designing, construction and maintenance of water supply systems, both city and irrigation, by A. Prescott Folwell, M. Am. Soc. C. E., M. N. E. W. W. Asso., Associate Professor of Municipal Engineering, Lafayette College. 562 pp. $4.00. John Wiley & Sons, New York.

The success of Mr. Folwell in giving a good outline of the processes of designing and constructing a water works system within the restricted limits of 560 pages is marked. The book will be an excellent text book for the use of scientific and technical schools, and an excellent guide for the detailed study of the many subjects related to the main work. About four-fifths of the book is devoted to the problem of design and the names of the chapters will give the ground covered. They include discussions of the quality and quantity desired, the sources of supply, including rainfall, surface water, rivers and lakes, ground water; the methods of supply, including gravity and pumping systems; a short chapter on the principles of hydraulics involved; and short descriptions of dams and embankments, pumping and pumping-engines and the methods of purification of water. About ninety pages are occupied with a discussion of the principles of designing works, and thirty pages in descriptions of methods of construction. In the third part are given suggestions on maintenance of reservoirs, headworks, intakes, pumping plants and filters, pipes and conduits, and a chapter on the clerical and commercial side of the management.

To carry all these subjects to the detail required by the designing and operating engineer, if a complete guide is required, would occupy several books the size of this one, and Mr. Folwell is to be congratulated upon his ability to condense and omit, and thus secure so valuable and at the same time so short a statement of the requisites of good design, construction and maintenance.

SEWERAGE—The designing, construction and maintenance of sewerage system. By A. Prescott Folwell, M. Am. Soc. C. E. Third edition revised and enlarged. 435 pp. $3.00. John Wiley & Sons, New York.

A notice of the first edition of this book, which was issued in 1898, appeared in these columns in 1899. A detailed notice of the book is therefore not needed at this time. The enlargement of the book is principally in the treatment of the sewage disposal problem, which has been extended from twelve pages to sixty. The methods of sewage treatment are divided into two classes, those to prevent nuisance and those to convert the sewage matter entirely into innocuous compounds. Under the first class are included the various clarification and precipitation systems; under the second, irrigation, filtration, bacteria beds and septic tanks. This subject is too large to treat in so small a space, but for the purposes of a class in sewerage which is learning what must be studied rather than trying to cover the field in an exhaustive manner, the chapters are of value, as they give a summary of the important conclusions of a number of books which treat the various phases of the question in detail, and of some articles in the engineering press which have not heretofore reached the books.

The second edition of the Gas Engine Handbook is now ready for delivery and can be supplied only in leather at $1.50. The appendix contains a new table of two-cycle engine dimensions and other date upon this type. The first edition was sold in six months. Municipal Engineering Company will fill orders.

Personal.

Foster Olryod has been appointed city electrician of New Orleans.

Wallace E. Johnson, M. Am. Soc. C. E., who has for fifteen years been chief engineer of the Niagara Falls Hydraulic Pow-

er and Manufacturing company, has accepted the position of chief engineer of the Shawinegan Water and Power company of Montreal.

J. H. Carpenter, C. E., has established a branch office in Mamaroneck, N. Y.

F. S. Smith, C. E., North Adams, Mass., has opened an office in Pittsfield, Mass.

J. L. Battie has resigned his position as assistant city engineer of Carbondale, Pa.

John Lott Nostrand, C. E., Brooklyn, N. Y., died Oct. 19, of pneumonia, aged seventy-one years.

Edward A. Greene, consulting engineer, New York City, has removed his offices to 40 Wall-st.

J. Herbert Campbell, Cohoes, N. Y., has accepted a position as civil engineer in Philadelphia, Pa.

C. A. Sias has been elected city engineer at Galveston, Tex., to succeed the late Capt. R. H. Peek.

Daniel J. Pendleton, surveyor of Clark county, and city engineer of Winchester, Ky., died Oct. 1st.

Judd A. Lockwood has been appointed assistant bridge engineer by the bridge commissioners of New York City.

J. Newton Ker has been temporarily appointed city engineer at Ottawa, Ont., to succeed City Engineer Galt, resigned.

George H. Hobson, president and treasurer of the Bullen Bridge company, Pueblo, Col., died Oct. 2 of catarrh of the stomach.

John J. Kirkpatrick, Holyoke, Mass., and E. A. Ellsworth have formed a partnership and will practice civil engineering in Holyoke.

G. L. Christian, Assoc. M. Am. Soc. C. E., has been appointed assistant engineer in the department of sewers, borough of Bronx, New York City.

Henry G. Isserted, electrical engineer, has been engaged to represent the Sprague Electric company, with temporary office in New York City.

George Treadway Thompson, president and treasurer of the Denver Gas and Electric Light company, Denver, Col., died at that city Oct. 2.

A. A. Knudson, M. Inst. E. E. New York City, has been retained by the water board of Reading, Pa., to make investigations of the electrolysis problem in that city.

G. D. Hardinger of Mineral Springs, O., will succeed Michael O'Brien as superintendent of the municipal water works and electric light plant at Upper Sandusky, O.

John F. Allen, M. Am. Soc. M. E., the inventor of the Allen high-speed engine, the Allen valve, the Allen air compressor, and various other mechanical appliances, died Oct. 4th.

Horace Ropes has been appointed division engineer in charge of the newly established department, known as the Western Aqueduct department, by the metropolitan water board of Massachusetts.

J. S. Jackson has resigned his position as superintendent of the City Street Improvement company at Spokane, Wash., to accept a position as business manager of a paving and construction company in Chicago.

Alfred D. Flinn, Assoc. M. Am. Soc. C. E., has been appointed lecturer on water supply and sanitary engineering at the Lawrence Scientific school, to succeed George S. Rice, M. Am. Soc. C. E., deputy chief engineer of the New York Rapid Transit Commission.

Charles E. Bedell of Montclair, N. J., superintendent of the New Jersey Steel and Iron company, who had charge of the construction of the steel work of the Brooklyn end of the new East river bridge, was killed Sept. 28 by falling from a steel spar in Kent-ave., Williamsburg.

H. E. Beasley has been appointed city engineer at Peoria, Ill., to succeed A. D. Thompson, resigned.

Mr. Thompson relinquishes the position for the purpose of entering the employ of Municipal Engineering Co., as assistant manager of Municipal Engineering, to which he will hereafter devote his entire time.

W. A. Eudaly of Cincinnati, O., has been appointed superintendent of the two yards of the Sangamon Brick company, at Springfield, Ill. Mr. Eudaly is one of the most widely known men among brick makers and has long been prominent in discussions of the national and state associations of brick makers. His superior qualifications will certainly make him a valuable man to the Sangamon company.

MACHINERY AND TRADE.

Dixon's Silica-Graphite Paint Protects from Corrosion.

At the ninth annual convention of the Association of Railway Superintendents of bridges and buildings, Detroit, Mich., Oct. 17 and 18, 1899, in a discussion on "What is the most economical method of painting railway bridges and buildings, and the best material to use," Mr. J. Y. Hill, roadmaster of the Southern railway, Knoxville, Tenn., said:

"Since I have been on the Southern railway system I think I have used about five or six different kinds of paint for bridges. We have used Mexican graphite, Superior graphite, Dixon's graphite, and are now using * * Paint. It seems to be the standard to use nothing but graphite on our road. About a year ago I ordered some paint, and our general superintendent furnished me with a barrel of Dixon's Silica-Graphite paint for testing. I painted a structure, an overhead bridge, where we have about twelve tracks running underneath, and are constantly switching day and night, which is a pretty severe test for any kind of paint. That paint has been on there one year now, and has given good satisfaction so far. I had about twenty gallons of this paint left and where I am using ** Paint at present is on a bridge of ten spans. It takes about twenty-six gallons of ** Paint

to a span, and I painted one span with Dixon's graphite, which was with the twenty gallons I had left, and I think there is a saving in Dixon's paint of about, well, 15 per cent.; and from my own observation I am very much in favor of that kind of paint. It covers better and leaves a well filled-in surface, as it ought to. I am very much pleased with Dixon's paint."

The Creo-Resinate Wood-Preserving Plant.

The United States Wood Preserving company of New York has acquired the plant of the New York Wood Vulcanizing company at Perth Amboy, N. J., and adapted it for its special process of preserving timber. A description of the principles upon which the process is based will be found in an article upon "A Method of Preserving Timber" in another column. The extent of the works and their ability to answer calls upon them is indicated by the view shown in the accompanying illustration. The timber packed on the cars ready to run into the tanks is shown. A transfer table at the end of the tracks permits the cars to be carried across the yards as necessary. The cylinders for heating the timber and for forcing the preserving material into it are in the buildings shown. The capacity of the plant is 50,000,000 feet a year. The officers of the company are at 1312 Empire Building, New York. Andres Bevier is President.

An Automobile Street Sweeper.

The first application of the automobile to street sweeping is made by the Automobile Street Sweeping company, 45 Milk-st., Boston. The machine cleans street and gutter, uses no horse power and claims a very large reduction in the cost of the work. Mr. A. C. Brown, superintendent of streets in Cambridge, Mass., has had one in use for the past summer and says: "We have used it constantly on our streets for the past four months, and it has given entire satisfaction. I know of no machine on the market today that sweeps the gutters so thoroughly and economically as this. I shall be glad to obtain another like it as soon as possible."

The Chase Sign Lamp.

Users of electric signs often experience trouble during wet weather, with short-circuits in the bases of the incandescent lamps used. Signs are commonly made tight at the back, and, as far as possible, around the receptacle. It has not always been possible, however, to secure an absolutely water-tight fit between the lamp and receptacle. To overcome this difficulty Charles A. Chase of Chicago submitted to the General Incandescent Lamp company, 39 to 47 E. Prospect-st., Cleveland, O., a sketch embodying his ideas. From this a special sign lamp has been developed and a patent on it applied for.

The main feature of this lamp is an enlargement or annular ring around the neck of the bulb. A rubber ring or gasket placed in front of this shoulder is compressed when the lamp is put in the receptacle, thus forming a tight joint. The electrical contacts of the lamps and the conducting portion of the socket are, therefore, protected from moisture.

While these lamps are intended especially for signs, they may be used to advantage in all outdoor work, as well as for industrial purposes, as in breweries and chemical works, where dampness or corroding gases make the use of electric lamps ...cult. The friction of the rubber against the abutting ring on the bulb, and the socket, it is said also, prevents the lamp from becoming loose in the receptacle.

These special lamps are made in bulbs of two sizes. One is 1¾ inches in diameter by four inches all over, and is made in all voltages from 45 to 130, and in candlepowers from four to ten inclusive. The smaller

size lamp is 1½ inches in diameter by three inches in length all over, and is made in candlepowers from two to six, inclusive.

These lamps are for sale at all offices of the General Incandescent Arc Light company.

Limestone for Macadam.

The Charles Warner Company of Wilmington, Del., has issued an attractive little pamphlet on "The Good Roads Question," with notes on Telford and Macadam roads and the value of different stones, which presents in small compass the advantages of good construction and incidentally presents the merits of Cedar Hollow stone for road purposes. A photograph of a section of a slab of concrete two feet by ten inches by four inches is shown, which had a crushing strength at thirty days of 202 tons per square foot. The components were one part Nazareth Portland cement, two parts Warner's bar sand, four parts Cedar Hollow screenings and eight parts Cedar Hollow one and one-half inch stone, all of which materials are furnished by the company.

Another booklet entitled "The Story of Cedar Hollow," 1750-1900, presents the merits of lime made from the same stone, which has been in use for 150 years.

McKelvey Concrete Mixer.

It has been the constant endeavor of men connected with concrete work to design a practical machine for mixing the ingredients thereof in order to reduce the cost and secure more thorough and even mixture than is given by hand mixing. Numerous machines have consequently been placed on the market, and several have proven fairly successful under certain restricting conditions. Machines that properly mix the materials are generally operated economically only on large works where frequent moving is not necessary.

The McKelvey concrete mixer was designed by Mr. McKelvey, after several years devoted to concrete work, and appears to be universally applicable to large or small jobs, stationary work, or where constant moving is required. The machine consists of a cylindrical mixing drum flaring sufficiently to work the material to the outlet end after it is thoroughly mixed. Attached to the inside surface of the drum are a number of blades set at an angle with the diameter, together with two hinged steel plates extending the length of the drum. This drum is set on a bearing supported by two wheels for easy transportation and is revolved by hand or machine power. The materials are shoveled into one end, turned in the ordinary machine eight times and issue from the other end a thoroughly and evenly mixed mass of concrete.

The machine is constructed throughout of steel and is strong and durable. It is made in all sizes for hand or machine power—the ordinary size requiring but four men to operate—two men to turn the drum and two for putting in the ingredients. It is claimed that fifty cubic yards of concrete can be mixed with a machine of this size with four men in ten hours.

Recent Inventions.

(Reported especially for MUNICIPAL ENGINEERING by Arthur M. Hood, Indianapolis, Ind. Copies of any patent may be obtained for ten cents.)

658,497. Sept. 25, 1900. Metallic Lathing and Roofing Construction for Buildings. Martin Carrick, San Francisco, Cal. A peculiar arrangement of channel beams and transverse beams for supporting concrete flooring.

658,639. Sept. 25, 1900. Sanitary Receiving Basin. Bernard R. Guion, New York, N. Y. Assignor of two-thirds to Alexander Lutz, same place, and James E. Walsh, Danbury, Conn. A catchbasin provided with a filtering discharge compartment and having a removable basket mounted in the main compartment by which solids may be easily removed from the basin.

658,640. Sept. 25, 1900. Apparatus for Purifying Sewage, B. R. Guion, New York, N. Y. Assignor of two-thirds to Alexander Lutz, same place, and James E. Walsh, Danbury, Conn. A specific arrangement for basins, purifying chambers and transporting car.

658,845. Oct. 2, 1900. Street Sprinkling and Cleaning Cart. Augustin Hentschell, Berlin, Germany. A watering cart carrying a scraper by means of which the dirt may be moved transversely on the pavement.

658,979. Oct. 2, 1900. Means for Cleaning Granular Filter Beds. John Davis, Pittsburg, Pa.

Mounted within the filter bed is a transversely movable agitator.

659,452. Oct. 9, 1900. Purification of Sewage. Owen W. Pfouts, Alliance, O.

Immediately adjacent to the receiving tanks is a sedimentation tank communicating therewith and from which the sewage falls over steps to oxidizing tanks having a hollow floor. A rotary motion is produced in the receiving tank by means of a peculiar arrangement of inlet and reduction pipes.

659,503. Oct. 9, 1900. Apparatus for Treating Sewage. Robert J. G. Wood, Leonia, N. J.

The sewage is discharged into an inclined perforated trough, the liquid portion passing there through upon an oscillating filter bed and the solids passing into and through a rotary kiln.

Trade Notes.

ASPHALT.

A number of capitalists of St. Paul, Minn., are considering plans for the erection of a plant for the manufacture of asphalt paving brick. The company will

be known as the Minnesota street paving and tile company.

BRICK.

The Abingdon Clay and Tile company, Abingdon, Ill., has changed its name to the Abingdon Paving Brick and Tile company.

J. W. Eberly and others will establish a vitrified paving brick plant at Strasburg, Va.

A vitrified brick plant will be established at Sherman, Tex., by Messrs. Soul & Kruger of San Antonio.

P. R. Chubbusk of Chicago contemplates the establishment of a paving brick plant at L'Original, Ont., Canada.

MACHINERY.

Reading, Pa., (Special)—The city clerk will receive bids until Nov. 1 for a sand dryer, capable of drying and purifying fifty tons of sand per day. Bidders must submit plans and specifications. Alex Murdock, cy engr.

CEMENT.

The Nazareth Cement company, Easton, Pa., has been incorporated to mine and quarry cement. The incorporators are G. F. Coffin, H. G. Seip, A. Sausser of Easton, D. Wallace, F. A. Stratton, P. H. Hampson, New York City.

The Carolina Portland Cement company, Charleston, S. C., has increased its capital to $15,000. P. G. Hanrahan, secy.

The Sandusky Portland Cement company, Sandusky, O., has increased its capital stock from $50,000 to $100,000.

The Contractors' Tool company of 118 S. Sixth-st., Philadelphia, Pa., supplies tools and machinery for pavers and roofers, which are well designed and give very satisfactory service. Their asphalt wagons and rollers are designed with special reference to ease in operation and in cleaning.

The plant of the Cumberland and Potomac Cement works, Pinto, Md., which was burned Aug. 18, is being rebuilt. A new cement mine is being opened on the West Virginia side of the river, and a mill will be built for temporary use while the burned structure is being rebuilt.

Again the Lawrenceville Cement company will begin the manufacture of cement at their mill in Eddyville, N. Y.

State Geologist Blatchley of Indiana has located a 60-acre deposit of marl, 30 feet in depth, three miles northeast of Culver, Ind.

The plant of the Caledonian Portland Cement company at Marl Bank, Ont., was almost completely destroyed by fire recently.

The National Carbon company, Cleveland, O., will build a Portland cement plant at Caledonia, N. Y. H. E. Hackenberg, Sterling Parks and Dr. J. A. Smith of Cleveland, are interested.

The Zenith Portland Cement company, Detroit, Mich., expects to erect its plant at Grass Lake, Mich., at once. The company expects to be manufacturing cement by May 1. F. E. Beebe, cons. engr.

The Birmingham Cement company is rebuilding its plant at Engley, Ala., for the manufacture of cement from slag.

John H. Killmar of Des Moines, Ia., representing eastern capital, is organizing a plant for the manufacture of Portland cement from Iowa limestone. The plant will be located in one of three towns—Mason City, Iowa Falls or Earlham.

SEWER PIPE.

The San Antonio Sewer Pipe company, San Antonio, Tex., has been incorporated by Aaron French and D. C. Noble of Pittsburg, Pa., and C. Upson and Geo. S. McElroy of San Antonio.

The Brooklyn Brick and Sewer Pipe company, Brooklyn, N. Y., has been incorporated by Geo. D. Beattys of Brooklyn, C. Fred Johnson and Herbert L. Fordham of New York City.

The Falls Creek Sewerage company, Falls Creek, N. Y., has been incorporated by G. Lemontague, B. C. Booker, J. B. Harter of Falls Creek; J. Kanooff, New Kensington; L. D. Rearick, Brockwayville.

Newly incorporated water companies: Coal Center water company, Coal Center, Pa.; Mace Springs water company, Bolivar, Pa.; Beacon mountain spring water company, Newark, N. J.; Sumet water company, Bakersville, Cal.; Blue Mountain water supply company, Stroudsburg, N. Y.; West Milton water company, Shamokin, Pa.; Beaverdale water company, Beaverdale, Pa.; Donora water company, Donora, Wash.; Cresco water company, Scranton, Pa.; Pitcairn water company, Pitcairn, N. Y.

ELECTRIC LIGHT COMPANIES.

The Auto-Electric Shunt company, West New Brighton, N. Y., has been incorporated to manufacture an attachment to be used in connection with arc and incandescent lamps. The incorporators are E. R. Cliff, A. B. Proal, jr., of West New Brighton; F. W. Wise, Port Richmond; M. L. Ryan, attorney, New Brighton.

The Acme Electric company, Chicago, Ill., has been incorporated to manufacture electrical supplies, by I. M. Crane, C. B. Stafford and W. Y. Miller of Chicago.

The South Jersey Gas, Electric and Traction company has been formed by capitalists of Newark, N. J., which includes the properties of the following companies: Camden Gas and Light company, the East Side Gas company, the gas and electric light interests in Merchantville, Mt. Holly and Woodbury, and the electric light interests in Haddonfield, Moorestown and Gloucester. The company also owns the entire capital stock of the Camden, Gloucester and Woodbury Street railroad company.

The authorized capital stock of the new company is $6,000,000. The officers and directors of the company are: President, Anthony R. Kuser, Newark; vice-president, William J. Bradley, Camden; secretary and treasurer, Thomas N. McCarter, jr., Newark. Directors: Uzal H. McCarter, Newark; Forrest F. Drayden, Newark; Chancellor Riker, Newark; Thomas Nevins, East Orange; John L. Kuser, Bordentown; William J. Thompson, Gloucester; John J. Burleigh, Camden; Herbert W. Johnson, Merchantville; Charles Watson, Camden; Barker Gummere, Trenton; Frank

Bergen, Elizabeth; Thomas C. Barr, Orange; Frank W. Montgomery, New York; Maitland F. Griggs, New York.

The Sinclairville electric light company, Sinclairville, N. Y., has been organized, with officers as follows: President, J. Colensoe; vice-president, E. J. Badger; secretary and treasurer, J. T. Dingley.

The Manhattan electrical supply company of New York City has purchased the patents, trade marks, manufacturing plant, stock and business of Hueber & Manger of Brooklyn. Arrangements have been made for increasing the company's supply warehouses at 32 Cortlandt-st., New York City, and a number of lots have been secured in Jersey City for factory purposes. Messrs. Hueber & Manger will have charge of the extensive manufacturing plant of the company in Jersey City.

Newly incorporated light and power companies: Jacksboro Light and Power company, Jacksboro, Tex.; Consumers' Heat and Electric company, Bloomington, Ill.; Gowanda Electric Light and Power company, Versailles, Ky.; Hunterdon Water Power company, Newark, N. J.; Washington Electric Light company, Washington, N. J.

WATER.

The Water Works Construction company, Jersey City, N. J., has been incorporated to operate water works, etc., by J. H. Beall, B. W. Mitchell, New York City; G. T. Vickers, Jersey City; Corbin & Corbin, attorneys, Jersey City.

MISCELLANEOUS.

The American Artificial Stone Paving company, Philadelphia, Pa., will build a large plant at Yankee Point, Schuylkill river.

Albert S. Dixon, Los Angeles, Cal., has been issued a patent for the manufacture of asphalt paper pipe. A continuous strip of paper is run through a bath of maltha, then through a bath of asphalt, and finally wound spirally on a mandrel wire being wound between the convolutions of the paper at the same time.

The United States Wood Preserving company of New York City is treating the blocks to be placed in Fremont-st., Boston.

The Sham Run Bridge company, Stowe township, has been incorporated by the following: G. H. Cole, Neville township; S. D. Robinson, Sewickley, Pa.; J. R. McCreery, Pittsburg; H. W. McDonald, Stowe township; G. T. McDonald, Allegheny, Pa.

The Filfert Paving company, Pittsburg, Pa., was granted a charter Oct. 19.

IMPROVEMENT AND CONTRACTING NEWS.

PAVING.

Moline, Ill.—An order sustaining the objections made to the petition for paving Sixteenth-st. was entered by Judge Adams, Oct. 13, on the ground that the board of education has no authority to petition for paving.

Los Angeles, Cal.—The application of the Alcatraz Asphalt Paving company for a writ of mandamus to compel the superintendent of streets, J. H. Drain, to sign a contract for paving Main-st., was denied Oct. 16 by Judge Trask. The proceedings were friendly, the intentions being to make a test case. After the publication of ordinance of intention a majority protest was filed against the proposed improvement. The law states that such a protest shall operate as a bar to proceedings for six months. Enough frontage was subsequently withdrawn from the protest to leave it without majority. City Attorney Haas held that the property-owners had the right to withdraw and advised the council that the protest had been invalidated and might be disregarded. The council advertised for bids and awarded the contract to the Alcatraz Asphalt Paving company. The company was anxious for the proceedings to be regular and made formal demand on the superintendent to sign the contract. The decision of Judge Trask was a surprise in that he passed upon another point instead of upon the one upon which the action was based. The protestants had not actually withdrawn, but had offered to do so. That being the case the protest was still in effect, Judge Trask upheld the stand taken by Superintendent Drain, who alleged that the protest acted as a bar for six months.

CONTEMPLATED WORK.

Helena, Mont.—Granite paving is desired for Main-st.

Everett, Wash.—Brick or block paving is proposed for Hewitt-ave.

Burlington, Ia.—The council has ordered several alleys paved.

Atlanta, Ga.—The question of paving Pryor-st. is being considered.

Stillwater, Minn.—The city council has ordered Main-st. macadamized.

Springfield, O.—An ordinance is pending for the paving of Lagonda-ave.

Hillsdale, Mich.—This city has appropriated $6,000 for street paving.

Pittsburg, Pa.—Ordinances have been passed for paving and curbing Shepton and Mead-sts.

Geneva, N. Y.—The board of aldermen has voted to bort w $2,500 for highway improvements.

Worcester, Mass.—Smooth paving is proposed for Foster, Mechanic and Main-sts.

San Pedro, Cal.—The question of issuing $23,500 street improvement bonds will be voted on Dec. 3.

Piqua, O.—Paving is contemplated for High-st. from Downing-st. to Washington-ave.

Toledo, O.—Creosoted wood block paving is contemplated for the Cherry-st. bridge.

Ft. Scott, Kas.—Vitrified brick paving is

contemplated for Main-st. from Wall to First.

Atchison, Kas.—Resolution was introduced Oct. 8 to p ve Main-st. from Fifth to Tenth.

Fairbury, Neb.—An ordinance has been introduced to curb the four sides of the

Duluth, Minn.—Asphalt paving is proposed for E. Superior-st., in the residence district.

public square.

Providence, R. I.—This city contemplates spending $30,000 in building the Allen-ave. boulevard.

Macon, Ga.—The question of issuing $150,000 bonds for permanent street improvements will be voted on

Memphis, Tenn.—Jefferson-st., from Main to Front, will be paved. A. T. Bell, cy. engr.

Des Moines, Ia.—Asphalt paving is favored for Twenty-first-st., from Cottage Grove to University-ave.

Princeton, Minn.—The question of issuing $25,000 bonds for road improvement will be voted on.

Syracuse, N. Y.—Laurel, E. Genesee and Grape-sts. will be paved with asphalt. R. R. Stewart, cy. engr.

Cincinnati, O.—A resolution was passed Oct. 16 for paving Butler-st., from Third to Fifth, with granite.

Charleston, W. Va.—An ordinance was introduced Oct. 4 providing for repaving Capitol-st. Cy. Engr. Hogue.

Elgin, Ill.—Forest-ave., from Liberty-st. to the East End, will be paved with brick on sand and gravel. Mayor Price.

Butte, Mont.—Plans have been made by City Engineer Bickenbach for paving a number of streets in the business section.

Syracuse, N. Y.—The common council has given notice of intention to pave Pearl-st. and E. Belden-ave. with bricks.

St. Joseph, Mich.—An ordinance was introduced Oct. 17 to pave Sixth-st., from Messanie to Patre, with asphalt.

Racine, Wis.—The property owners on Water-st. have petitioned for macadam paving instead of brick, with brick gutters.

Albany, N. Y.—An ordinance has been passed to pave Bradford-st., from Lexington-ave. to Robin-st., with brick.

Birmingham, Ala.—Vitrified brick paving is proposed for Avenue-K and for curbing Eleventh-ave., north. Mayor Drennen.

Bowling Green, O.—A petition is being circulated for paving Wooster-st. Brick, asphalt and asphalt block are proposed.

Minneapolis, Minn.—The question of issuing $150,000 bonds for permanent street improvements will probably be voted on.

St. Louis, Mo.—The board of public improvements will give a hearing Nov. 2 on propositions to improve a number of streets and alleys.

Council Bluffs, Ia.—An ordinance has been passed providing for asphalt paving on First and Fifth-aves., and Sixth and Eighth-sts.

Marshall, Mich.—The council has decided to construct a brick gutter around West End park. Petitions have been granted for cement walks.

Battle Creek, Mich.—A resolution has been passed to pave S. McCamby-st. from W. Main to W. Jackson. Both brick and asphalt are advocated.

Wilmington, Del.—The question of issuing $10,000 bonds for extending Fourth-st. to the river is being considered by street and sewer department.

Troy, N. Y.—Resolutions are favored for brick paving on Oakwood-ave., from Tenth-st. to Summit-ave., and for paving Seventh-ave. Cy. Clk. Lecomte.

Lorain, O.—A resolution is pending for paving E. Erie-st., from Black river to Fifth-st. A resolution has been passed for building sidewalks in Frankfort and Granger-sts.

St. Paul, Minn.—Paving is proposed for Eighth-st. The park board has directed the city engineer to make a preliminary survey for a parkway on the West Side bluffs.

Newport, Wash.—The question of expending $40,000 on the improvement of Coggesshall-ave. will be voted on. Resolutions have been passed to improve a number of highways.

Eau Claire, Wis.—The estimated cost of paving Grand-ave., west, with brick is $1.65 a sq. yd.; resetting old curb, 10 cents a lin. ft.; new curb, 55 cents. The street will be macadamized west of Oxford-ave.

Corsicana, Tex.—Mayor Johnson recommends an ordinance requiring property owners to build cement walks in residence portions of the city, and that vitrified brick be constructed in all other parts of the city.

San Francisco, Cal.—The Merchants' Association, through Supervisor Reed, is endeavoring to have the board of public works appropriate money to repave accepted streets in the business section of the city.

New Albany, Ind.—Ordinances have been passed providing for vitrified brick paving on State-st., from Main to Oak and an alley. Edward Crumbo, mayor; Thomas M. McCullock, cy clk.

Oklahoma City, Ok. T.—The city council has directed the city attorney to prepare an ordinance for paving the main streets of this city. The material has not been decided upon but brick is advocated.

Michigan City, Ind.—A resolution is pending providing for the paving of Fourth-st., from Washington to Wabash, with brick. Objections will be heard Nov. 12. The estimated cost of paving Pine-st. with asphalt is $21,458.34. Cy. Engr. Miles.

Baltimore, Md.—The annual committee on highways has decided upon a general plan of street repairing, including portions of the following streets: Asphalt, Chase and Baltimore-sts.; asphalt blocks, North-ave. and McCulloh-sts.; Belgian block, Carey, Thames, Parnet, Madison and Block-sts. and Front-ave.

CONTRACTS TO BE LET.

Altoona, Pa.—Bids are asked until Nov. 2 for macadamizing Willow-ave. and Fourth-st. W. J. Hamon, cy. clk.

Delaware, O.—Sealed bids are asked until Nov. 10th for repairing sidewalks for one year. E. E. Naylor, cy. clk.

Savannah, Ga.—Bids are desired for furnishing 12,000 sp. yds. of granite blocks. Geo. M. Gadsen, dir. pub. wks.

Janesville, Wis.—Sealed proposals are asked until Nov. 19th for grading Division-st. C. V. Kerch, chrm. St. Assmnt. Com.

Toledo, O.—Bids are asked until Nov. 12 for grading Central-ave., from Collingwood-ave. to Cherry-st., and until Nov. 26 for paving South-st. and Summit-ave. with asphalt or block. J. E. Connell, cy. clk.

Trenton, N. J.—Bids are asked until Nov. 6 for vitrified brick paving on concrete in Pike alley. C. Edward Murray, cy. clk.

Greenfield, Ind.—Sealed bids are asked until Nov. 7 for the construction of cement walks on Fifth and State-sts. Wm. R. McKown, cy. clk.

Ellington, Conn.—Bids are asked until Nov. 3 for constructing two sections of gravel road. E. E. Miller, 1st selectman.

New Orleans, La.—Bids are asked until Nov. 24 for paving a portion of Third-st. A. Schrieber, secy. drainage com'rs.

Evansville, Ind.—Sealed bids are asked until Nov. 15 for grading the extension of Pennsylvania-st. in Pigeon twp. W. E. Males, trus. Pigeon twp.

Crawfordsville, Ind.—Sealed proposals are asked until Nov. 5th for the improvement of the east side of Vance-st., from Market to Main. E. S. Simpson, cy. engr.

Greensburg, Ind.—Sealed bids will be received until Nov. 7th, for constructing curb and gutter on E. Washington-st., between Franklin and Lathrop-sts. William Brazleton, cy. clk.

Toledo, O.—Sealed bids are asked until Nov. 5 for paving Floyd-st. with asphalt, asphalt block or vitrified brick or block, and until Nov. 19 for paving Thirteenth-st. with vitrified brick or block, asphalt or Kreodone creosoted or asphalt blocks. John E. Connell, cy. clk.

Atlantic City, N. J.—Sealed bids are asked until Nov. 7 for the construction of a gravel road from Egg Harbor to a point in the Little Egg Harbor river opposite Green Bank, a total distance of seven miles. John T. Irving, dir., Elwood, N. J.; John J. Albertson, engr., Magnolia, N. J.

Middletown, O.—Sealed proposals will be received until Nov. 7 for the construction of cement sidewalks and curb and gutters on both sides of Baltimore-ave., between Forest and Fairmount-aves.; for curb and gutter on both sides of Moore-st., between Third and George-sts., and on a portion of Thomas-st. Frank Stevens, cy. clk.

Lakewood, O.—Bids are asked until Nov. 3 for curbing, grading and draining Lake-ave. extension, including the following: 45,000 cu. yds. exc.; 6,000 cu. yds. exc. in tunnel; 11,600 lin. ft. 7x20-in. curbing; 7,820 ft. 10 to 30-in. pipe sewers; 40 catch basins; 100 cu. yds. brick masonry. R. J. Wood, hamlet engr; John G. French, hamlet clk.

CONTRACTS AWARDED.

Columbus, O.—The contract for paving E. Gay-st. was awarded to N. B Abbott.

Cincinnati, O.—J. M. Quill secured the contract for paving Mead-ave. with brick for $5,020.

Hamburg, N. Y.—The contract for paving Buffalo-st. with brick was awarded, Oct. 11, to Louis Gipp of Tonawanda.

Yonkers, N. Y.—William J. Flanagan secured the contract for regulating, grading and improving McLean-ave. for $21,320.

Elizabeth, N. J.—N. H. Welden was awarded the contract for paving Sayre-st. with telford, for $2,935.

Milwaukee, Wis.—The contract for granite paving on St. Paul-ave. was awarded to R. J. Hickey at $2.94 a sq. yd., and for 1,756 ft. of curbing at 48 cts. a lin. ft. E. B. Perkins secured the contract for a cement walk on Chestnut-st.

Wellston, O.—John F. Welsh of Nelsonville, O., secured the contract for paving S. Penn.-ave. with limestone for $15,702.

Home City, O.—Henkel & Sullivan of Cincinnati secured the contract for macadamizing Independence-ave. for $10,750.

Louisiana, Mo.—The contract for building about 10,000 ft. of granitoid sidewalks was awarded to Sam Smashey.

Hartford, Conn.—The Southern New England Paving company was awarded the contract Oct. 1 for paving Capitol-ave. with land asphalt.

New York City—Bids were received Oct. 25 for paving in Bronx park at prices varying from 65 cents to $1 a sq. yd.

Moline, Ill.—The Barber Asphalt Paving company secured the contract for paving Seventeenth-st., from Fourth to Eighth, with asphalt for $11,265.

Dodson, Mo.—Colyer Bros. secured the contract for extending the Dodson and Grandview macadam roads two and three-fourth miles at 80 cents a sq. yd.

Bridgeport, Conn.—The contract for building a macadam road was awarded Oct. 16 to the Williams & Dewhirst company of this city at $1.60 a lin. ft.

St. Augustine, Fla.—The contract for paving Cathedral-place and Hypolita-st. with Reynolds vitrified brick was awarded Oct. 17 to McGuire and McDonald.

Camden, N. J.—William Sherman was awarded contracts Oct. 2 for repairing Elm, Van Hook, Sixth and Eighth-sts. with Belgian blocks at $1.42 a sq. yd.

Jersey City, N. J.—John Nolan was awarded the contract for opening and improving Nolan-ave., for $25,855, and Fowler-ave., for $34,843.

Jersey City, N. J.—The contract for three blocks of Belgian block paving on Kensuth-st., Union hill, was awarded to Calley & Murphy for $6,633.

Cincinnati, O.—The Warner Quinlan Paving company, Syracuse, N. Y., was awarded the contract for paving Eastern-ave. with asphalt for $75,076.15.

Schenectady, N. Y.—The Schenectady Contracting company has sublet the contract for paving Emmett-st. to McCauley & McCabe of Troy. Catskill brick will be used.

Bloomington, Ind.—The contract for improving E. Third-st., from University heights to College-place, was awarded Oct. 18 to Stewart Bros. at $1.32 1-3 a lin. ft.

New Haven, Conn.—The contract for paving Temple-st. with brick was awarded Sept. 27 to the Coryell Construction company of Williamsport, Pa., at $2.28 a sq. yd.

Lake Forest, Ill.—The contract for building more than a mile of Sheridan road in Highland Park has been awarded to Dolese Bros. of Chicago for $21,997.

Waukesha, Wis.—E. W. Cahill of this city secured the contract Oct. 2 for 29,000 sq. yds of macadam paving and 4,000 lin. ft. of curb and gutter for $16,505.

Newark, N. J.—Frank C. O'Reilly was awarded the contract Sept. 27 for paving Miller-st., from Sherman to Elizabeth-ave., with brick at $1.95 a sq. yd., or $3,488.

Kansas City, Mo.—The Barber Asphalt

Paving company was awarded the contract Sept. 27 for paving the alley between the city hall and the market house with asphalt at $2.12 a sq. yd.

Chicago, Ill.—R. F. Conway & Co. secured the contract Oct. 15 for repairing Thirty-ninth-st. over the intercepting sewer system, from Grand boulevard to Vincennes-ave.

Washington, D. C.—The Colburn Paving company was awarded contracts for 40,000 sq. yds of class A cement walks at $1.05½, and 15,000 sq. yds. of class B walks at $1.18¾.

Newark, N. J.—The contract for paving Magazine-st., with granite blocks on cement was awarded to the B. M. & J. F Shanley company of Philadelphia at $2.73 a sq. yd., or $19,781.

Middletown, O.—The Barber Asphalt Paving company secured the contract for paving S. Main-st. for $29,554, and N. Main-st. for $12,122, according to press reports.

St. Joseph, Mo.—The Phoenix Brick company secured the contract for paving Pateest. and several down town alleys. The Barber Asphalt Paving company was awarded the contract for paving Faraon-st., from Twentieth to Twenty-second.

Port Fulton, Ky.—W. O. Sweeney has been awarded contracts for macadamizing a number of streets, constructing vitrified brick crossings, granitoid walks and Bedford stone curbing. The contract price is $14,000.

Somerville, N. J.—The contract for building a macadam road from this place to the Far Hills, a distance of eight miles, was awarded, according to press reports, to Wm. Hardgrove of this place for $28,854.

New Brunswick, N. J.—The contract for 2,000 sq. yds. of brick paving on concrete was awarded to R. A. Montgomery of Lambertville at $2.05 a cu. yd.; also 1,500 sp. yds. 12-in. Telford macadam at $1.27 a sq. yd.

St. Paul, Minn.—The lowest bid submitted for boulevarding Marshall-ave., from Grotto to Victoria, was that of Christ Johnson, $1,999, and for Hall-ave., from Isabel-st. to the edge of the bluff; D. W. Moore, $1,444.

Albany, N. Y.—The contract for resurfacing Madison-ave. was awarded Oct. 9 to Warner & Quinlan of Syracuse at $1.34 a sq. yd. A contract was awarded during October for paving Plain-st. with brick to Edward L. Dillon.

Des Moines, Ia.—The contract for paving Twenty-first-st., from Cottage Grove-ave., to University-ave., with brick was awarded to J. H. Killmar at 91 cts. a sq. yd. The contract was disapproved Oct. 19 and a resolution passed to pave the street with asphalt.

Provo City, Utah—Tucker & Goodman secured a contract Oct. 15 for 750 lin. ft. of paving at $1.98 a lin. ft. The contract included crossings for the principal streets, crossings J and Seventh-sts. Heber or granite flagging and paving blocks will be used.

Milwaukee, Wis.—The contract for paving Ogden-ave., from Marshall-st. to Darrell-ave., was awarded to the Western Paving and Supply company at $2.21, and the contract for Sixteenth-st., from Grand-ave. to Clybourn-st., to the Warren Scharf Asphalt company at $2.19 a sq. yd.

Seattle, Wash.—The contract for paving First-ave. south from Yesler Way to King-st. with brick was awarded, Oct. 6, to T. Ryan for $21,486. C. J. Erickson secured the contract for grading, parking and building walks on E. First-st. for $2,687.50 and on Sixteenth-ave. for $6,520.10.

Brazil, Ind.—Brick paving contracts were awarded Oct. 18 as follows: W. Main-st., first section, Voorhees & Co. of Terre Haute, $1.29 a sq. yd. outside of car tracks and $1.39 between the tracks; W. Main-st., second section. Erler & Peters Terre Haute, $1.45 and $1.54.

Denver, Col.—The contract for paving Pennsylvania-ave. with crushed basalt or crushed "live" granite was awarded to John O'Neil for $1,793. The Bermudez-Blake asphalt paving company secured the contract for paving Colfax-ave. with asphalt at $2.13 a square yard, or $35,570.34.

New Orleans, La.—John McCoy was awarded the contract for paving the neutral ground of Canal-st. with granolithic pavement at $1.26 a square yard, or $50,524. The Louisiana improvement company secured the contract for paving Third-st. with asphalt at $1.68 a sq. yd. without binder.

Rockford, Ill.—The Barber asphalt paving company was awarded the contract for paving Seventh-st. as follows: 10,763 square yards of asphalt, $1.90 a square yard; 1,910 square yards of brick, 79 cents a sq. yd.; concrete under brick, 25 cents a cu. yd.; excavation, 1 cent a cu. yd. Total, $22,410.

Carbondale, Pa.—Bids have been received for paving N. Church-st., with brick, as follows: Blair & Kennedy, $2.25 a sq. yd., including grading and concrete, new curbing 55 cts. a lin. ft., resetting old curbing 15 cts.; P. Y. Moran, $1.84 for paving, new curbing 43½ cts., resetting old curb 11 cts.

Winona, Minn.—The contract for paving Main and Johnson-sts. was awarded Oct. 22 to John Deghan at $1.20 a sq. yd. Des Moines brick will be used. The Winona Construction company was awarded the contract for paving Lafayette-st. at $1.39 a sq. yd. The Beisanz Stone company secured the contract for a stone sidewalk on Baker-st.

Winona, Minn.—Bids were received Oct. 22 for paving Michigan-st., from Lake-ave. to Eighth-ave. and the contract will probably be awarded to Watterworth & Fee of this city, who bid $1.77 a sq. yd. for removing the present cedar block pavement and relaying with 13,563 sq. yds. of Kettle river sandstone blocks at $1.92 per sq. yd. for cement foundation with sand filling.

Decatur, Ind.—Special.—W. E. Fulk, C. E., says contracts were awarded Oct. 25 for building macadam roads as follows: Monroe township, central macadam road, E. Woods & Co., Decatur, $20,488.50; Pleasant Valley & Oak gravel macadam roads, E. Woods & Co., $18,727.25; William Shoemaker macadam roads, Phillips & Polley, Dunkirk, Ind., $4,189.80; C. E. Bollinger macadam road, William Eckrote, Marion, Ind., $17,166.

New York City.—Paving contracts were awarded Oct. 20th, as follows: Asphalt, One Hundred and Eleventh-st., from Amsterdam Ave. to Riverside Drive, Barber

Asphalt Paving Co., $14,526.90; asphalt, One Hundred and Thirty-fourth St., from Park to Madison Ave., Asphalt Construction Co., $5,099.93; asphalt, Bedford Ave., from Butler St. to Eastern Parkway, Brooklyn, Hastings Pavement Co., $14,891.53; macadam Trossach Road, Borough of Richmond, Joseph Walker, $2,679; granite block, Twelfth-st., Chas. R. Baird, $51,000.19.

Dallas, Tex.—The Barber Asphalt Paving Co. secured the contract, according to press reports, for paving Elm St. with asphalt. The company's bid was as follows: Removing blocks, 6c per sq. yd., $1,791.20; grading, 4c per sq. yd., $1,194.73; laying street asphalt pavement, with concrete foundation No. 1, $2.40 per sq. yd., $71,648.25; laying sheet asphalt pavement, with concrete foundation No. 2, $2.20 per sq. yd., $65,677.56; concrete No. 1, under crossing, switches, frogs, etc., $6.85 per cu. yd., $171.25; concrete No. 2, under crossings, switches, frogs, etc., $5.50 per cu. yd., $137.50; new curbing furnished in set; 56c per lin. ft.; hauling excavated material for each 100 feet over 2,500 feet, 4c per cu. yd.

For paving the street railway portion as follows: Removing blocks, 7c per sq. yd., $62.80; grading, 10c per sq. yd., $886.36; laying sheet asphalt pavement, with concrete foundation No. 1, $2.48 per sq. yd., $21,994.12; laying sheet asphalt pavement, with concrete foundation No. 2, $2.28 per sq. yd., $20,220.40; concrete No. 1, under crossings, switches, frogs, etc., $6.85 per cu. yd., $171.25; concrete No. 2, under crossings, switches and frogs, $5.50, $137.50; hauling excavated material for each 100 feet over 2,500 feet, 4c per cu. yd.

SEWERS.

Indianapolis, Ind.—City Engineer Jeup is preparing estimates for cleaning the state ditch.

Manchester, England.—Plans for new sewage purification works for this city have been adopted by the city council. The estimated cost is $2,371,000.

Passaic, N. J.—The mayors and engineers of the municipalities emptying sewage into the Passaic river are united in favoring the proposed trunk sewer.

New Britain, Conn.—Claims aggregating $27,000 were instituted against this city Oct. 5 because of the alleged pollution of the Mattaberett river by sewage.

CONTEMPLATED WORK.

Belvidere, Ill.—A new sewer in Lincoln ave. is proposed.

West Orange, N. J.—The council has passed the joint sewer ordinance.

Waterbury, Conn.—Sewers are contemplated for Rye and Hill-sts.

Woodbury, N. J.—The estimated cost of building sewers is $55,000.

Irvington, N. J.—The joint sewer ordinance has been passed by the town board.

Washington, Ia.—A sewer in E. Jefferson-st. is contemplated. Mayor Ross.

Suffolk, Va.—The town council decided Oct. 2 to build a sewerage system.

McKeesport, Pa.—A new sewer is proposed for Fifth-ave., between Huey and Walnut-sts.

Campbelltown, N. B.—The estimated cost of building a sewerage system is about $25,000.

Hampton, Ia.—The question of a sewerage system is being agitated again.

Atchison, Kas.—A sewerage system for South Atchison is again being agitated.

Guthrie, O. T.—The question of issuing bonds for building a sewerage system will be voted on.

Louisville, Ky.—The question of issuing bonds for new sewers will be voted on in November.

Long Beach, Cal.—Plans are being prepared for a proposed sewerage system. C. E. Wallace, cy. engr.

High Point, N. C.—Plans have been prepared for cast iron and vitrified pipe sewers. J. J. Cox, mayor.

Rockaway Beach, N. Y.—A sewerage system on the beach is proposed by the Property-owners' association.

Rensselaer, N. Y.—A resolution has been passed to build an eight-inch tile sewer on Aikin-ave.

Hattiesburg, La.—Surveys, maps and profiles are being made for a complete sewerage system.

New Britain, Conn.—The plans for the new sewerage system call for about fifty miles of sewers.

Sherman, Tex.—The legislature will be asked to authorize an issue of bonds for new sewers.

Green Bay, Wis.—The committee on sewers is considering plans for building sewers next year.

Tuckahoe, N. Y.—The construction of certain sewers and sewage disposal works is recommended.

Ft. Dodge, Ia.—A resolution is pending for a storm sewer on Sixteenth-ave., north, from Sixteenth to Eighteenth-sts.

Danville, Ky.—The question of issuing $25,000 bonds for a new sewerage system will be voted on in November.

Lansing, Mich.—The city engineer has been directed to prepare plans for a sewer in the alley of block No. 110.

Georgetown, D. C.—The residents of the county are urging the completion of the Arizona-ave. trunk sewer.

Galveston, Tex.—The sewerage system will be constructed soon. Bonds for $500,000 were sold before the storm.

Bryan, O.—Resolutions have been passed for constructing tile drains in certain streets and alleys. J. W. Hoke, cy. clk.

Hamilton, Ont.—Te acquisition of Dundas Marsh for the purpose of sewage disposal by scientific principles is contemplated.

Erie, Pa.—The construction of 9 in. sewer to take the place of a main sewer on the East Side is being considered.

Vincennes, Ind.—Plans and specifications for a sewerage system will be prepared by Mr. C. C. Brown of Bloomington, Ill.

St. Louis, Mo.—Plans are being prepared by Sewer Commissioner Hermann for the reconstruction of the sewers in the business section of the city.

Toledo, Ia.—Plans for a sewerage system are being prepared by M. Tschirgi, of Dubuque, and contracts for about a mile will be let in November.

Syracuse, N. Y.—Preliminary estimates were submitted Oct. 15 for a brick or web tile sewerage system in First, North, Grif-

fith, Cleveland, Carbon, John, Division and other streets, and a twelve-inch tile sewer in La Forte-ave.

Toronto, Ont.—City Engineer Rust has submitted a report on the bacterial and septic sewerage systems, but advises further investigation.

New Britain, Conn.—The sewer committee will submit a report to the council Nov. 21 regarding the erection of a sewage disposal plant.

Wellsville, O.—The question of issuing $65,000 bonds to complete the storm water sewers will be voted on in November. A. G. White, cy. engr.

Weehawken, N. J.—Plans are being considered for a pumping station for the disposal of the sewage in the lower village. George W. Bond, jr., town. engr.

Vassar, Mich.—President LeValley of the board of trustees has been authorized to correspond with engineers regarding the estimated cost of building a sewer.

Wakefield, Mass.—Surveys are being made for the proposed sewerage system. Contracts will be let about Dec. 1 for the outfall sewer. William B. Daniel, secy. bd. sewer commis.

Venice, Ill.—Mayor Scott is considering plans for the elevation of certain streets and a general sewerage system for that section of town east of the railroads.

Chester, Pa.—An ordinance was affirmed Oct. 17 for building a main sewer on Front-st. with branch sewers on Ellsworth, Norris and Church-sts. F. W. Harrison, cy. clk.

The question of building sewerage system is being agitated at the following places: Canal Dover, O.; Fayetteville, Ark.; Merchantville, Pa.; Fenton, Mich.. Pottsville, Pa.; Visalia, Cal.

Circleville, O.—The sewer committee is considering the report of City Engineer Abernathy regarding the construction of a sewer. The report divides the city into three sewer districts.

Birmingham, Ala.—The board of revenue authorized, Oct. 9, the preliminary survey of the route of the proposed sewer for Jefferson county. Julian Kendrick, cy. engr., was engaged to take charge of the work.

Columbus, O.—The estimated cost of the sewerage system recommended to the sewer commissioners by Chief Engineer Griggs is $1,703,223. The plans provide for the septic tank system and the use of double cone filtrations.

Wauwatosa, Wis.—The special committee appointed to investigate sewerage systems reported Oct. 16 in favor of the septic tank system. The council will consult expert engineers regarding the subject before deciding.

CONTRACTS TO BE LET.

Newark, O.—Sealed bids are asked until Nov. 9 for a pipe sewer in Cedar-st. F. F. Maurath, cy. clk.

East Cleveland, O.—Bids are asked until Nov. 2 for sewers in four streets. H. O. Chapman, vil. clk.

Springfield, O.—Bids are asked until Nov. 2 for a 12-inch pipe sewer in W. Columbia-st. R. N. Lautz, cy. clk.

Crookston, Minn.—Bids are desired until Nov. 13 for building a sewer. W. A. Lanctot, cy. clk.

Muncie, Ind.—Bids are asked until Nov. 5 for a vitrified pipe sewer in Cherry-st. F. W. Clevenger, cy. clk.

Adel, Minn.—Bids are asked until Nov. 20 for building a certain county ditch. C. R. Logan, co. audt.

St. Paul, Minn.—Sealed bids are asked until Nov. 9 for a sewer in Charles-st., from St. Albans to Grotto.

Redfield, S. D.—Bids are asked until Nov. 12 for pipe sewers in Emerson-st and Franklin-ave. J. S. Huston, cy. clk.

Indianapolis, Ind.—Bids are asked until Nov. 2 for a main sewer in W. New York-st. Albert Sahm, chrm. B. P. W.

Marquette, Mich.—Sealed bids are asked until Nov. 5 for building the Genesee-st. trunk sewer. Franklin E. Bay, cy. clk.

Summit, N. J.—Bids are asked until Nov. 7 for building about 800 feet 6-inch pipe sewer in Beauvoir-ave. Dani. C. Day, cy. clk.

Greeley, Ia.—Bids are asked until Nov. 2 for building 1,320 feet of 8-inch sewer in dist. No. 8. M. P. Henderson, cy. clk.

Baltimore, Md.—Sealed bids are asked until Nov. 24 for extending the boundary sewer. H. B. F. MacFarland, chrm. dist. comrs.

Oshkosh, Wis.—Sealed bids are asked until Nov. 17 for building sewers in Minnesota and Hazel-sts. Frank Monahan, chrm. B. P. W.

Washington, D. C.—Sealed proposals are asked until Nov. 24 for extending the Boundary sewer. H. B. F. MacFarland, chrm. dist. comrs.

Elkhart, Ind.—Sealed bids are asked until Nov. 7 for sewers in Franklin and Bower-sts. and Virginia-ave. L. E. Hitchcock, cy. engr.

Boston, Mass.—Sealed bids are asked until Nov. 3 for building section 73 of the high-level sewer in West Roxbury. Wm. M. Brown, jr., ch. engr. Met. Sewerage Com'n.

Buffalo, N. Y.—Bids are asked until Nov. 9 for 10 to 20-in. tile sewers in two streets, and a 5-ft. brick and 15 to 20-in. tile sewer in Lang-ave. R. G. Parsons, secy. B. P. W.

Boston, Mass.—Bids are asked until Nov 12 for building sections 58, 59 and 60 of the Metropolitan sewer in Malden and Melrose. W. M. Brown, jr., ch. engr. Met. Sewer Com'n.

Lorain, O.—Sealed bids are asked until Nov. 7 for constructing sewer connections from the main sewer to the curb on Second-ave., from Broadway to Wash. J. J. Mahoney, cy. clk.

Glenville, O.—Separate bids are desired until Nov. 13 for a settling tank for the sewage disposal works and for a storm water sewer in Euclid View-ave. Ira C. Farley, vil. clk.

CONTRACTS AWARDED.

Joliet, Ill.—P. McHugh secured the contract for building a sewer for $1,000.20.

Beloit—The contract for a sewer in Vernon-ave. was awarded to John C. Clark for $2,133.

Buffalo, N. Y.—The contract for a twenty-inch sewer in Casino-st. was awarded to John Mumm for $7,200.

Spokane, Wash.—The contract for a sewer in Maple-st. was awarded to R. A. Hutchinson for $1,798.

Morris, Ill.—The contract for a sewer in

Liberty-st. was awarded to Joseph Healey of Morgan Park for $5,540.

Davenport, Ia.—The contract for the East End main sewer was awarded to the Flick & Johnson construction company.

Springfield, O.—The contract for a sewer in Woodlawn-ave. was awarded to Ulrick & Williams for $9.567.75.

Muncie, Ind.—The contract for a sewer in Madison-st. was awarded to Gibbins & Garey of New Castle at $1.75 a lineal foot.

Florence, Col.—The contract for a sewer in district No. 1 was awarded Oct. 16 to Piper Bros. of Pueblo for $31,805.06.

Jesup, Ia.—The contract for sewers in the South district was awarded Oct. 2 to Webster & Blaes of Dubuque, Ia., for $2,697.

La Crosse, Wis.—Olaf Swennes secured the contract for a sewer on West-ave. and Thirteenth and Vine-sts. at 62½ cents a lineal foot.

Marquette, Mich.—Eric J. Johnson secured the contract for a sewer in Fisher-st. at 68 cents a lineal foot and $50 each for manholes.

Saratoga Springs, N. Y.—The contract for a twenty-four-inch tile sewer in Buffalo-st. was awarded to August Schneider & Son at $1.54 a lineal foot.

Chicago, Ill.—The contract for completing the Thirty-ninth-st. intercepting sewer was awarded Oct. 22 to John P. Agnew for $637,200.

Hornellsville, N. Y.—Gould & Neylen of Bath secured the contract for building a sewer from the county jail to the Cohocton river, for $888.

Mansfield, O.—The Reaugh Construction Co. of Cleveland secured the contract for the construction of the sanitary bacteria beds, for $6,155.

Hamilton, Ont.—Sewer contracts were awarded Oct. 5th, as follows: Simcoe-st., D. Newlands, 34 cts. a lineal foot; Stinson-st., J. J. Armstrong, 34 cts.

Erie, Pa.—Edward Driscoll secured the contract for a main sewer in East-ave., at 31½cts, a foot, for straight pipe, and 68½ cts. for branch pipe.

Indianapolis, Ind.—The contract for building a sewer in the first alley west of Broadway was awarded Oct. 19th to Eugene Sheehan, at 96 cts. a lineal foot.

Luverne, Minn.—The contract for a sewer in Main-st. was awarded to A. L. Jones of Canton, S. D., at $1.30 a lineal foot for 8-inch pipe and $1.35 for 9-inch, $1.50 for 10-inch and $1.60 for 12-inch pipe.

Omaha, Neb.—Contracts were awarded Oct. 15th for sewers in three districts, as follows: No. 110, George Dare, 75 cts a lineal foot, and $3.90 each for manholes; No. 108 and 109, J. E. Riley, 79 cts. a lineal foot, and $3.50 for manholes.

Camden, N. J.—Sewer contracts were awarded Oct. 16th, as follows: Seventh-st., from Grant to York, E. F. Sweeten & Son, $1.45 a lineal foot; Newton-ave., W. Thompson, $1.47 a lineal foot; Mt. Ephraim-ave. Aaron Ward, $1.58 a lineal foot.

WATER-WORKS.

Knoxville, Tenn.—The Knoxville water company was fined $250 Oct. 11 for violation of the city's lower water rate ordinance.

Mt. Vernon, Ill.—(Special.)—This city purchased the water and light plant Oct. 8 for $100,000. John J. Hainsworth of Indianapolis, Ind., acted as appraising engineer, negotiating between the city and companies, and financed the entire proposition.

CONTEMPLATED WORK.

Fairview, Man.—A new water works system is proposed.

Eldon, Ia.—An increased water supply is proposed.

East Helena, Mont.—The question of a water supply is being considered.

Spokane, Wash.—Plans are being prepared for remodeling the water works system.

Keeseville, N. Y.—The question of securing a new water supply is being considered.

Norwalk, Conn.—The question of an increased water supply is being considered. Mayor Glover.

Mt. Ayr, Ia.—The city council has appropriated $700 to be used in prospecting for a water supply.

Summerhill, Pa.—An ordinance has been passed providing for laying water mains. Michael Tully, pres. com.

Troy, N. Y.—Specifications will be published for a new water supply system. Bd. of contract and sup.

San Francisco, Cal.—The question of acquiring a municipal water works plant will be voted on Feb. 1, 1901.

Norwich, N. Y.—Contracts will be let soon for conducting water from Chenango lake into the Norwich reservoir.

Atlantic City, N. J.—A 30 in. wooden water main across the meadows is recommended by William C. Hawley, engr. water dept.

Diagonal, Ia.—O. S. Martin, N. E. Freelans and John Allyn have been appointed a committee to secure a water supply.

Seattle, Wash.—Bids will probably be asked for laying an 8-in. main on Seventeenth-ave., from Yester Way to E. Madison-st.

Richmond, Va.—Plans are being considered for water clarification.

Middletown, N. Y.—Plans are being prepared for an addition to the water works including a reservoir, water pipe, etc. J. O. Austin, cy. clk.

Wellsville, O.—(Special.)—The question of issuing $75,000 bonds for improving the city water works will be voted on in November. A. G. White, cy. engr.

Lynchburg, Va.—This city is proposing to bring a water supply of five to ten million gallons a day from a distance of twenty-five miles. C. L. DeMott, cy. engr.

Water mains extensions are proposed, as follows: Burlington, Vt.; Janesville, Wis.; Denver, Colo.; Oswego, N. Y.; Manhattan, Kan.; Painesville, O.; Chicopee, Mass.; Pittsburg, Pa.

The question of issuing water bonds will be voted on at the following places; Mt. Clemens, Mich.; Harmony, Minn.; Georgetown, Ky.; Owensboro, Ky.; Nov. 6th, Woodstock, Va.

Minneapolis, Minn.—J. T. Fanning and Wm. de la Barre have recommended sedimentation basins, a new intake, and a large new pumping station. The estimated cost of the basin is $430,000.

Youngstown, O.—The city council voted, Oct. 2, to adopt the recommendation of the water works trustees to secure a water supply from Mill creek. The question will be voted on in November.

The question of issuing water works bonds has been favorably voted on at the following places: High Point, N. C.; Plattsburgh, N. Y.; Darrell, Minn.; Cardington, O.; Kingfisher, O. T.; Fultonville, N. Y.; Englishtown, N. J.; Albany, Mo.; Adams, N. Y.; Mt. Gilead, O.; Leetonia, O.

The construction of water works systems is contemplated at the following places: Osawatomie, Kan.; Woodstock, Va.; Industry, Ill.; Lidgerwood, N. D.; Glendive, Mont.; Thompson, Ga.; North Yamhill, Ore.; Falls Church, Va.; Calhoun, Ky.; New London, Ia.; Tampa, Fla.; Warren, Ind.

CONTRACTS TO BE LET.

Waynesville, O.—Bids are asked until Nov. 13 for a water and light plant. C. D. Reed, clk.

Albert Lea, Minn.—Sealed bids are asked until Nov. 9 for building and constructing a 10 and 12-in. well.

Carrollton, Ill.—Bids are asked until Nov. 8 for building the new water works extension. Engr. Ford.

Pawnee, O. T.—Sealed bids are asked until Nov. 10 for a system of water works. J. D. Ramsey, mayor. M. H. Bretz, cy. clk.

Toledo, O.—Bids are asked until Nov. 4 for furnishing 10 to 15 filters of 40 to 100 gals. capacity. Bd. of Education.

Brooklyn, N. Y.—Bids are asked until Nov. 8 for laying water mains in two streets. Wm. Dalton, com. water sup. New York City.

Pittsfield, Mass.—Bids are asked until Nov. 20 for constructing a dam at Ashley Lake for the water works. J. L. Bacon, chm. com.

Rahway, N. J.—The opening of bids for furnishing two 100 h. p. horizontal boilers has been deferred until Nov. 7. D. G. Ormston, clk. water comrs.

Bloomfield, Neb.—Sealed bids are asked until Nov. 6 for a complete water works system. W. D. Funk, clk. Arnold C. Koenig, engr., Grand Island, Neb.

Yonkers, N. Y.—Bids are asked until Nov. 8 for excavating and refilling trenches for about 6,000 ft. of 6 and 12 in. pipe. A. W. Kingsbury, clk. water bd.

Cincinnati, O.—Sealed bids are asked until Nov. 13 for furnishing cast iron pipe for the settling reservoirs and for the pump mains from the eastern pumping station on the water works grounds, near California. Aug. Herrmann, prest. bd. trustees w. w. commis.

CONTRACTS AWARDED.

Nunda, Ill.—W. H. Wheeler & Co. of Chicago secured the contract for a water works system for $12,000.

Durand, Mich.—T. C. Brooks & Son of Jackson secured the contract for a new water works system for $30,000.

Charleston, W. Va.—The contract for a water works system was awarded to the Newark Water Works Construction company.

Cincinnati, O.—The contract for the new tunnel was awarded to W. J. Gawne & Co. of Cleveland for $659,230.

St. Marys, W. Va.—The contract for a water works system was awarded to H. T. Day of Bellaire, O., for $13,120.

Braddock, Pa.—The contract for building the addition to the water works plant was awarded to Jacobs & Patton of Pittsburg for $8,974.

Charleston, Ill.—The contract for a water works and electric light system was awarded, Oct. 15, to R. Lester Thayer & Co. of Peoria for $16,800.

Richmond, Va.—The contract for the Wachusett dam across the Nashua river at Clinton, Mass., was awarded to McArthur Bros. company of Chicago for $1,603,365.

Norwich, N. Y.—The contract for constructing the conduit line for conveying the water from Chenango lake into the city reservoirs was awarded to Newhall, Armstrong & Co. of New York City.

Appleton, Minn.—The contract for an 80-ft. steel tower and a 65,000-gal. tank for the water works system was awarded to the Gillette-Herzog Mfg. company of Minneapolis for $2,925. Fairbanks, Morse & Co. of St. Paul will furnish 2,000 ft. of mains and six hydrants for $1,714.

BRIDGES.

Davenport, Ia.—New bridge over Steuben creek on Garfield-st. is under consideration.

Napoleon, N. D.—Bids are wanted Nov. 12 for bridge over Beaver Creek. J. A. Wood, co. audt.

Niles, Mich.—A special election to vote $6,000 for new bridge across St. Joe river, held Oct. 29.

Ottawa, Ont.—Council is considering $75,000 bridge over St. Lawrence river from Hull to Bank-st.

Monessen, Pa.—Secretary of War is considering plans proposed for bridge over Monongahela river.

North Adams, Mass.—Mayor Wilkinson recommends to the City Council a new $7,000 bridge on Eagle-st.

Lestershire, N. Y.—The D. L. & W. R. R. will probably build a bridge over their tracks at Main-st.

Montrose, Colo.—T. W. Morrell, co. clk., will receive bids Nov. 14 for bridge across the Uncompahgre.

Pittsfield, Mass.—The city and the Street Railway company are considering a new bridge at South-st.

Penn Yan, N. Y.—John R. Briggs of Herkimer receives contract for improving Liberty-st. bridge at $3,764.

Troy, O.—Bids wanted Nov. 6 for substructure of bridge over canal on Market-st. N. A. Slater, cy. clk.

Big Rapids, Mich.—Mecosta twp. has voted $3,000 to build an iron bridge across Muskegon river west of Stanwood.

Billings, Mont.—Bids wanted Dec. 3 for bridge over Yellowstone, plans and specifications furnished by bidders.

Kansas City, Mo.—Engineer Kesler is preparing plans for bridge at Benton Boulevard for Park Board and Belt Railway Co.

Nelson, Neb.—Bids wanted by noon Nov. 13 for iron wagon bridge across Liberty creek, two miles east of Lawrence, 60-ft.

span on 24-ft. piers, bidder to furnish plans and specifications. Jas. A. Hedgcock, clk.

Joliet, Ill.—Council has increased appropriation for Exchange-st. bridge to cost $20,000. Mayor Mount. Chrm. Burke of Bridge Com.

Leavenworth, Kan.—Bids wanted Nov. 5 for bridge on branch of Ninemile creek near the Mound school house. Plans with J. W. Niehaus, co. clk.

San Jose, Cal.—Bids are wanted until Nov. 7 for 120-foot combination bridge over Coyote creek, estimated at $4,000. P. P. Austin, chrm.

Barberton, O.—Steel bridge, 60-feet wide, costing $35,000 will be built and paid for by the city and Erie R. R. Co. W. A. Winter, clk.

Grand Island, Neb.—Bids are wanted Nov. 14 for three combination bridges each forty feet with sixteen feet roadways. C. H. Mench, co. clk.

Rapid City, Mich.—Boards of Supervisors of Antrim and Kalkaska counties have decided on location for drawbridge over Torch river.

Rapid City, Man.—Tenders for 110 cu. yds masonry abutments for bridge across Little Saskatchewan river received Nov. 1. Dennis E. R. Daly, town clk.

Decatur, Ala.—The L. & N. R. R. is making surveys for a $250,000 bridge across the Tennessee river. W. P. Carroll, supervisor of bridges, Montgomery, Ala.

Wytheville, Va.—Bids will be received Nov. 12 for wooden wagon bridge, stone foundation 350-foot spans over Cripple Creek near Beverly Farms. F. M. Heuser.

Cincinnati, O.—Superstructure of bridge over Mill creek at Spring Grove costing $30,000, will shortly be open to bids. Robt. Allison, pres. bd. pub. service.

Shelbyville, Tenn.—The Bedford county court has ordered the erection of three steel bridges across Duck river, at Hall's Mill, Shofner Ford, and across the Garrison Fork.

Seabright, N. J.—Irregularity in advertisement caused rejection of bids for drawbridge across South Shrewsbury-ave. New bids will be called for. Estimated cost $65,000.

East Hartford, Conn.—A committee of the selectmen will report before Dec. 15 on cost of new bridge to take place of the wooden bridge over Hockanum river on Forbes-st. Burnside.

Milwaukee, Wis.—Architectural club extends close of competition for ornamental designs for new bridge at Grand-ave. to Nov. 13. Best one will be recommended to city authorities.

Indianapolis, Ind.—Bids will be received at 10 a. m. Nov. 7 for superstructure of bridge on Indian creek on Hickory gravel road in Franklin twp. Audt. Harry B. Smith has plans.

Albany, N. Y.—Bids are wanted Nov. 7 for arch bridge over Erie canal at Lockport, for swing bridge over Champlain canal at Waterford, and for bridge over Black river between Greig and Twin.

Crystal Fall, Mich.—Bids are wanted for steel bridge across Paint river on county road to Amasa, bidders to make their own measurements and specifications. Arthur E. Briggs, Edwin C. Searls.

Ft. Scott, Kas.—Bids will be received by the commissioners of Bourbon county until Nov. 5 for the construction of a 56-ft. steel low truss bridge with 12-ft. roadway. Lydia Barton, co. clk.

Philadelphia, Pa.—Ordinances are under consideration appropriating $40,000 for Allegheny-ave. bridge and $19,000 for Rising Sun-ave. bridge over North Penna. R. R., and $74,000 to carry Lehigh-ave. under Penna. R. R. tracks.

Atlanta, Ga.—A viaduct 95 feet span and approaches will be built over railroads on Whitehall-st. City Engr. Clayton has drawn up plans and railroads will pay the cost. Mayor Woodward is promoting it. Advertisements will be issued shortly.

Indianapolis, Ind.—Bids will be received at 10 a. m., Nov. 7, for superstructure of bridge over Bush Run on Lafayette gravel road. Auditor Harry B. Smith has plans. John McGregor, Henry L. Harding, Jas. Greer, co. comrs.

Cincinnati, O.—The Board of Public Service rejected bids for Liberty-st. viaduct as exceeding City Engineer Stanley's estimate about $20,000, and asked him for a new itemized estimate when new bids will be called for.

Indianapolis, Ind.—Bids will be received at 10 a. m., Nov. 7, for superstructure of Indian Creek bridge in Franklin twp. on Indian Creek gravel road. Harry B. Smith, audt., has plans and specifications. John McGregor, Henry L. Harding. Jas. E. Greer, co. comrs.

Seneca, Kas.—Bids will be received at noon Nov. 8 for iron bridge 36-ft. long on six piles 24-ft. long and with 24-ft. of approach, and for iron bridge 70-ft. long set on 4 iron tubes 30 ft. long and with 80-ft. of approach. Plans and specifications on file with county clerk. J. T. Sanders, chrmn. bd. co. comrs.

New York City.—The East River Bridge Com'rs. awarded contracts for iron and steel approaches to the new East River bridge to the Pennsylvania Steel company at $2,411,000. The New Jersey Steel & Iron company bid $2,400,000, but contract was not let to it because now behind on other contracts connected with the bridge.

Mt. Carmel, Ill.—A bridge across the Wabash is strongly urged.

Chippewa Falls, Wis.—This city is about to build a $40,000 bridge.

Williamsburg, Md.—A bridge across the Potomac is under consideration.

Mercer, Pa.—Bridges at Chestnut-st. and Mill-st. are granted by co. comrs.

Honesdale, Pa.—Co. comrs. will build iron bridge in place of one condemned.

Oakland, Cal.—A $4,000 bridge over Sausal creek at Hopkins-st. is considered.

Fairview, Pa.—Co. comrs. are preparing plans for bridge over the Antietam here.

McKeesport, Pa.—The Union Traction company is considering a viaduct in the Tenth ward.

Watervliet, N. Y.—State Canal board has approved plans for bridge at Twenty-third-st.

Cleveland, O.—Bids are wanted by city for the middle Seneca-st. bridge; estimated cost, $75,000.

Waukegan, Ill.—The mayor recommends to the council a $20,000 steel bridge on Genesee-st.

Scranton, Pa.—Ordinance for viaduct at

Lackawanna-ave. is in hands of city council.

Burlington, Ia.—Old project for railroad and wagon bridge across Mississippi revived, S. Mellinger, vice-pres.; A. B. Grupe, J. Epstein, T. R. Rankin, John Steinbecher, Geo. Stewart, J. A. Kleppisch, F. S. Churchill, John Blaul and H. Witte, incorporators of Mississippi River Bridge company in 1891, are again interested and propose to get government charter if possible.

STREET LIGHTING.

Madison, Neb.—Will put in a new electric light plant.

La Crosse, Wis.—Is considering an electric light plant.

Traverse City, Mich.—A gas franchise is under consideration

New Iberia, La.—Has voted 158 to 58 for water works and electric light.

Jefferson City, Mo.—Council has voted to build an electric light plant.

Pullman, Wash.—The Commercial club is agitating a municipal electric light system.

Fremont, O.—Has let contract for lighting on moonlight schedule at $70 a light for ten years.

New Baltimore, Mich.—Will vote, Nov. 3, on question of bonding village for electric light plant.

Chicago, Ill.—An ordinance has passed the council providing for 75 cent gas after Jan. 1, 1901.

Newell, Ia.—A new pumping plant and a gas lighting plant are under consideration, costing about $8,800.

New London, Ia.—A petition for a vote on electric light and water works has been presented to the council.

Durant, I. T.—Bonham capitalists have formed a joint stock company with $20,000 stock to run electric light and ice plant.

Waterford, N. Y.—Contract for forty or more arc lights of 2,000 candle power at $95 per annum has been let to Sam'l. T. Page.

Oil City, Pa.—Water and Light Com'rs are authorized to advertise for bids for lighting the city in case it becomes necessary.

Bessemer, Ala.—This city is discussing the establishment of a municipal electric light plant. Thos. T. Huey, mayor.

Richmond, Ind.—J. B. Nelson of Indianapolis is preparing plans for an electric lighting plant and the contract for construction will be let this winter.

Florence, Ala.—Edward J. O'Beirne of Birmingham has been granted an electric light franchise and will begin work on the plant in sixty days.

Clinton, Wis.—A special election will be held Nov. 6 to vote $5,500 for the purchase and erection of a gas plant and building for same and water works.

Coffeyville, Kas.—Contract for new municipal electric light and power plant has been let to a St. Louis contractor for $17,952 and work will begin at once.

Galveston, Tex.—The electric light plant is again in working order. Supt. D. Hall will be in charge of the reconstruction made necessary by the great storm.

Sidney, O.—The light committee of the city council has prepared specifications for a new contract for lighting streets and bids will probably be called for.

Wakefield, Mass.—The Municipal Light Board have applied to the State Board of Gas and Electric Light Commissioners for permission to furnish gas in Stoneham, adjoining.

Ripon, Wis.—Bids are wanted at 1:30 p. m., Jan. 3, 1901, for franchise for supplying electric light for city on five, ten and fifteen year propositions. F. W. Allen, clerk, has specifications.

Jamestown, N. D.—Alexander Hughes of Bismarck has made a proposition to the city council to put in an electric plant for the city and one to pump a water supply. New works will be constructed in either case.

Matanzas, Cuba—Bids are wanted Dec. 15 for providing city with electric or gas lighting and electric tramways, together or separately. Specifications with Jimenis & Co., 114 Wall-st., New York. D. Leucona, mayor.

Middleport, N. Y.—C. H. Cramer, A. H. Garland and Edward Knapp are a committee to visit villages owning electric light plants and to report. A special election was held Oct. 29 to decide on municipal ownership or contract with company.

San Francisco, Cal.—Municipal ownership of the lines and poles for electric lighting is proposed, the furnishing of current to be let by contract. The city engineer has prepared plans. The Independent electric light and power company is interested. Mayor Phelan and the supervisors have the matter under consideration.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

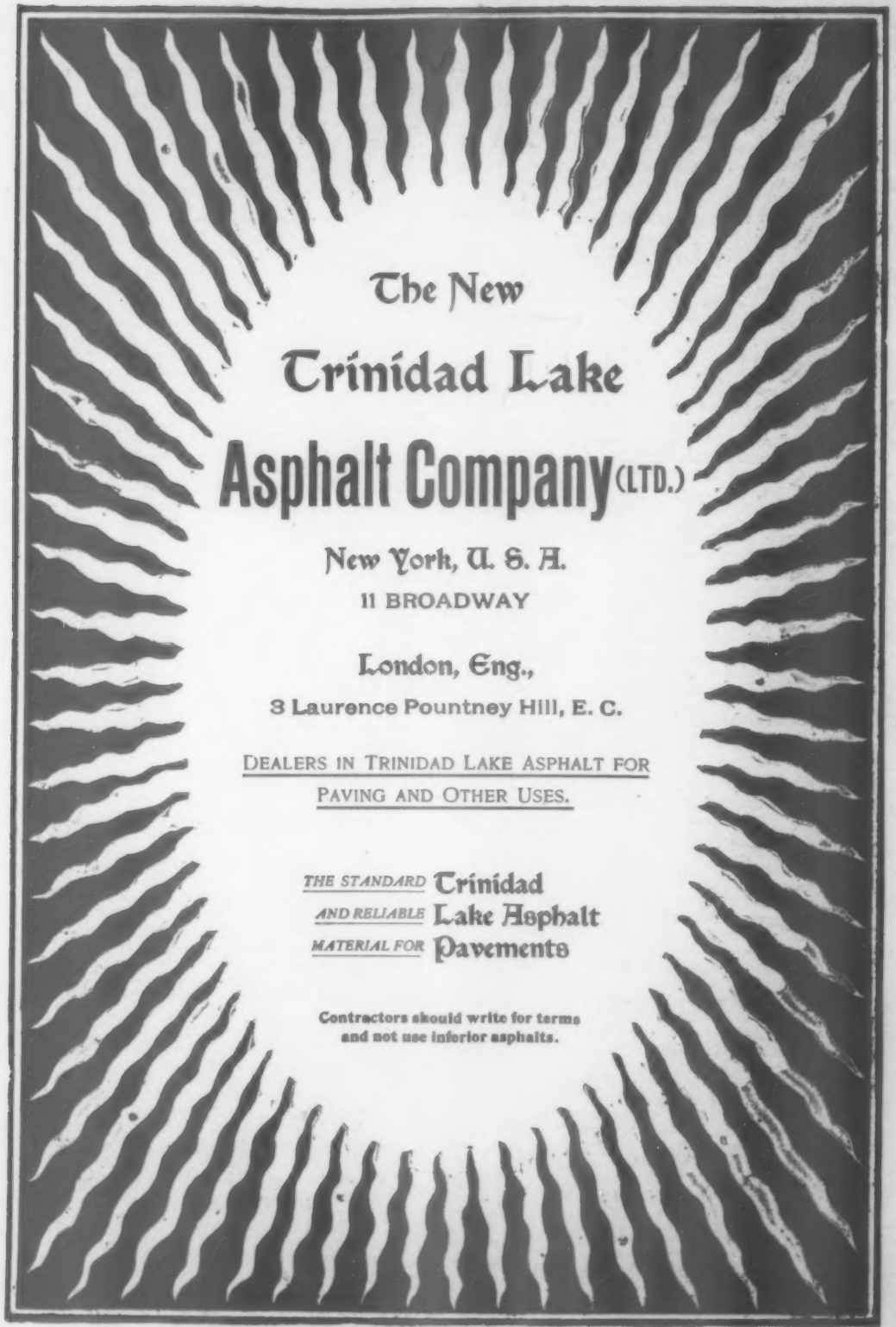
New Castle, Pa.—A garbage disposal plant is proposed.

Pittsfield, Mass.—A better method of disposing of the city's garbage is proposed. J. J. Nelligan.

St. Louis, Mo.—The funds for street sweeping have been exhausted, and the streets cannot be swept after Nov. 1.

New York City—The board of estimate and apportionment has approved the forms of contract for garbage disposal for a period of five years, beginning Aug. 1 1901, for Manhattan and the Bronx.

Buffalo, N. Y.—The garbage reduction works, owned by the Baynes Garbage Reduction company were burned Sept. 30. The board of public works has awarded the contract for disposing of the city's garbage to A. H. Case & Co. of East Buffalo at $50 per day until the Baynes Bros.' crematory is rebuilt.



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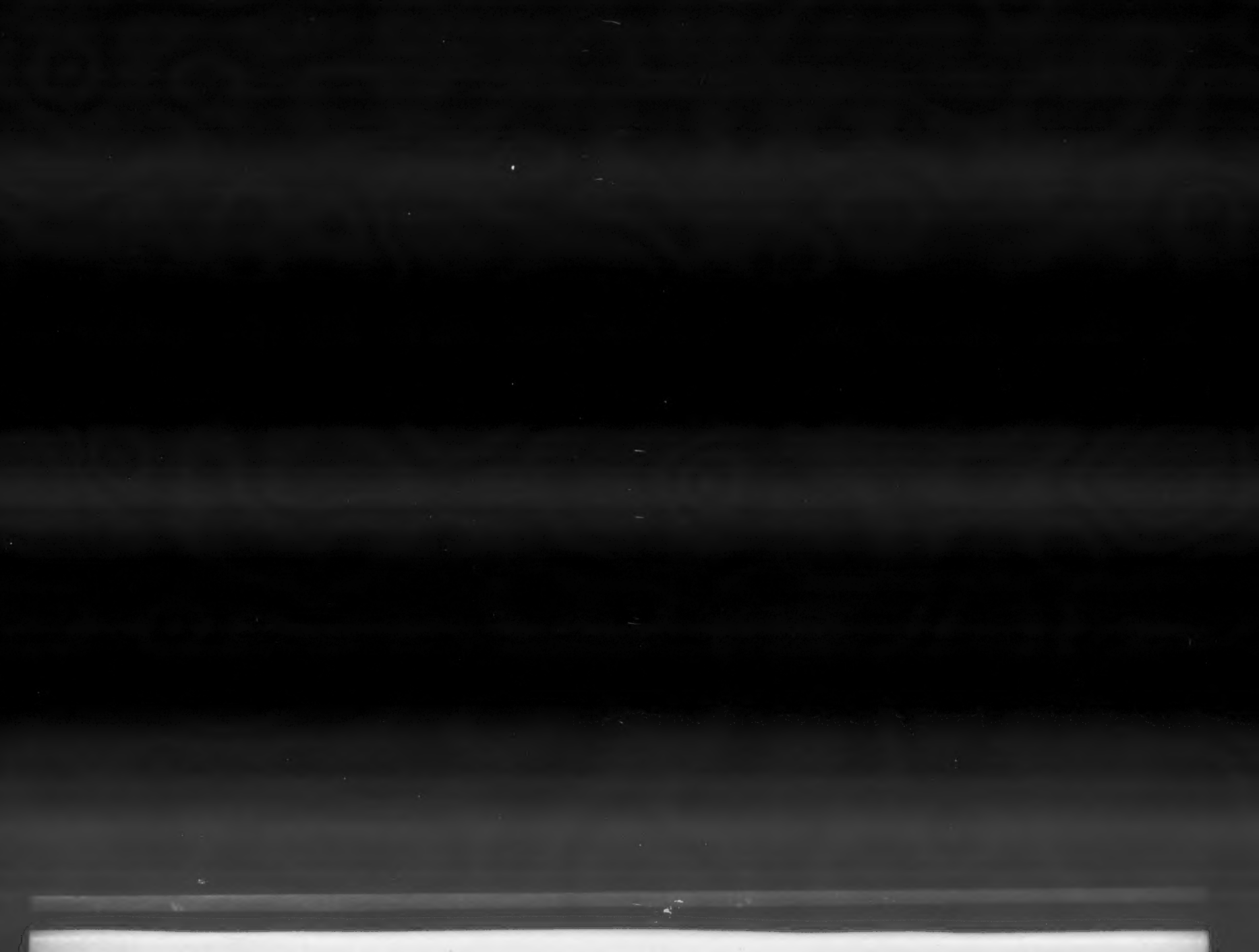
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